Diabetes in Utah



















2006



Acknowledgements

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Craig Merrill, MPH
Betsi Patino
Brenda Ralls, PhD

Bureau of Health Promotion
Amy Bowler, BA
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Randy Tanner, MPH
Shelly Wagstaff, BS

Center for Health Data
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Kathryn Marti, RN
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Office of Vital Records and Statistics
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Office of Health Care Statistics
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National Tongan American Society
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Data Sources

Data used in this report are drawn from several sources. The Utah Health Status Survey (UHSS) is a statewide study that collects health-related information at the household level. The UHSS collects information on a variety of topics related to health status and health care access for the state and local health districts. This survey is designed to represent Utahns of all ages. The UHSS is conducted in-house by the Survey Center in the Office of Public Health Assessment, Utah Department of Health. More information is available at http://health.utah.gov/opha/OPHA_HSS.htm

The Utah Department of Health also conducts the Utah Behavioral Risk Factor Surveillance System (BRFSS), which focuses only on adults. The BRFSS collects uniform, state-specific data on preventive health practices and risk behaviors that are linked to chronic diseases, injuries, and preventable infectious diseases in the adult population. Data are collected by the Survey Center in the Office of Public Health Assessment, Utah Department of Health through monthly telephone interviews on a random sample of non-institutionalized adults. The BRFSS is one of the primary data sources for tracking diabetes prevalence, care and complications in the state. Approximately 5,000 Utah adults aged 18 and over are interviewed each year. More information on the BRFSS is available at http://health.utah.gov/opha/IBIShelp/brfss/Background.htm

Information from state-certified diabetes education programs is also included. As part of the Utah Diabetes Prevention and Control Program (DPCP) certification process, each program submits annual reports on clinical measures obtained by its clients, including A1C exams and lipid profiles, and blood pressure control. The data in this report are based on documentation obtained from state-certified programs representing 2,625 patients.

The Hospital Discharge Database (HDDB) contains consolidated information on complete billing, medical codes, and personal characteristics describing a patient, the services received, and charges billed for each inpatient hospital stay. The Office of Health Care Statistics in the Utah Department of Health receives quarterly discharge data from Utah hospitals. The data are converted into a standardized format. More information is available at http://health.utah.gov/hda

Birth and death record information is obtained from the Utah Office of Vital Records and Statistics (OVRS). This office participates in the National Vital Statistics System and documents and certifies births and deaths. This office makes a dataset with no personal identifiers available for health programs, health care providers, businesses, researchers, educational institutions and the Utah public for data and statistical purposes. More information is available at http://health.utah.gov/vitalrecords/AboutUs.htm

Healthy People 2010 objectives are included in this report as appropriate. The Healthy People 2010 report, developed by the U.S. Department of Health and Human Services in 2000, specifies a number of indicators shown to be important in improving the nation's health. Benchmarks from Healthy People 2010 are incorporated into program targets and are referred to in this report. A list of the 17 Healthy People 2010 objectives for diabetes are included in the appendix. More information is available at http://www.healthypeople.gov.



Summary

Twenty million Americans--an estimated seven percent of the U.S. population--have diabetes. About 4,000 Americans are diagnosed with diabetes each day.[1] In Utah, an estimated 93,000 residents, or approximately one of every 25 Utahns, has been diagnosed with diabetes. For people age 65 or over, the prevalence is closer to one in five (20.7%).[2]

In its earliest stages, type 2 diabetes is a silent disease that may go undiagnosed for years. Some individuals may unknowingly have diabetes for as long as ten years and are diagnosed only after serious complications have developed. In addition to those already known to have diabetes, approximately 42,000 more Utahns have diabetes but have not yet been diagnosed.[2]

Pharmaceutical interventions play an important role in helping people with diabetes maintain their blood sugar levels within normal ranges. In some rare cases, lifestyle changes alone can reduce blood sugar levels below the clinical threshold for a diabetes diagnosis. Nevertheless, the underlying metabolic syndrome and genetic propensity remain, and most experts agree that diabetes can never truly be cured.

Complications of diabetes can be devastating. Each year, in the U.S., between 12,000 and 24,000 people with diabetes become blind, more than 42,800 develop kidney failure, and about 82,000 undergo leg, foot, or toe amputations. Diabetes is the leading cause of new cases of blindness in adults under age 75, and is the leading cause of end-stage renal disease, non-traumatic lower extremity amputations, and blindness among working-age adults. Nerve damage brought on by diabetes can create severe pain and impaired sensation in hands and feet. Most notably, diabetes increases the risk of heart disease and stroke by two to four times.

A number of studies have shown that improvements in care to control blood pressure, blood glucose, and blood cholesterol levels could reduce the risk of complications. Deaths could be reduced by as much as 30 percent.[3]

One in every ten health care dollars (10.6%) in the U.S., or $91.8 billion a year, is spent for direct health care costs for people with diabetes.[4] Additionally, indirect costs, such as lost productivity, disability, and premature mortality, bring the total estimated costs to $132 billion a year.

Diabetes is the sixth leading cause of death in Utah and in the U.S. In 2004, Utah death records listed diabetes as the underlying cause in 485 deaths, or about one of every 27 deaths in the state.



Section One
Overview of Diabetes

Diabetes Defined

Diabetes mellitus represents a variety of chronic metabolic disorders that result from excessively high blood glucose levels. Lack of, or insufficient use of, insulin prevents the body from keeping blood glucose levels within normal ranges and diabetes develops. Insulin is a hormone that helps to convert sugar, starches, and other food into energy. Without sufficient insulin, the body is unable to effectively break down sugar so that it can enter the cells. This in turn leads to abnormally high levels of glucose in the blood. The resulting high blood glucose levels can affect multiple organs of the body and lead to severe complications, including heart disease, blindness, nerve damage, amputations, and renal failure.

Diabetes is usually classified into two broad categories: (1) type 1, generally considered to be an autoimmune disease that develops when the pancreas fails to produce insulin, and (2) type 2, which results from an inability of the body to use insulin, too little insulin production, or a combination of both. A third type of diabetes, gestational diabetes, develops in women during pregnancy and usually disappears after delivery. However, women who develop gestational diabetes are at increased risk for developing type 2 diabetes later in life. There is emerging evidence that infants born to mothers with diabetes may be at increased risk of developing diabetes themselves.[5]

Types of Diabetes

Between five and ten percent of people diagnosed with diabetes have type 1 diabetes (also referred to as juvenile-onset or insulin-dependent diabetes). People with type 1 diabetes must have insulin injections or pumps to survive. This type of diabetes is most often diagnosed prior to age 30 and, while it is believed to be an autoimmune disease, the exact cause is not known.

Most people with diabetes have type 2 diabetes, sometimes called adult-onset or non-insulin-dependent diabetes. Nationally, type 2 accounts for 90 to 95 percent of all diabetes cases. While genetic propensity plays a prominent role in the risk of developing diabetes, other characteristics such as obesity, aging and membership in a particular racial or ethnic group (e.g., Hispanic/Latino; African American; Native American; Pacific Islander) also increase the risk. Until recently, type 2 diabetes was concentrated in middle and older ages, but it is being seen at increasingly younger ages, even among pre-teens and adolescents.[6]

Among women, gestational diabetes is a type of diabetes that is first diagnosed during pregnancy. For most women with gestational diabetes, the elevated blood glucose levels disappear after delivery, although, in some cases, the additional stress of pregnancy can trigger a permanent state of diabetes. A woman who has experienced gestational diabetes has an increased risk of developing diabetes later in life. Furthermore, women with gestational diabetes are at higher risk for serious complications such as stillbirths, congenital malformations, macrosomia (birthweight greater than 4,000 grams), and cesarean sections. Infants born to mothers with diabetes during pregnancy appear to be more vulnerable to



developing diabetes themselves as they mature.[5] About 135,000 women, accounting for about four percent of all pregnancies, develop gestational diabetes each year in the U.S.[7] In Utah, the rate is lower. Still more than 1,100 Utah women (roughly two and one-half percent of all pregnancies) develop gestational diabetes each year.[8]

Rarer types of diabetes can result from malnutrition, certain illnesses, drugs, surgery, or congenital defects. [9, 10] Some genetic disorders also play a role. For example, hemochromatosis (excessively high levels of iron) can damage the pancreas sufficiently to cause diabetes. Cystic fibrosis and its associated high levels of mucus can affect digestion, which in turn appears to be linked to an increased risk of diabetes. Combined, these rarer types of diabetes make up less than two percent of all diabetes cases.

As more becomes known about diabetes, new types of diabetes, or combinations of types, are being identified. One newly defined classification has been identified by several names: type 1.5, slow onset type 1, late-onset autoimmune diabetes of adulthood, or latent autoimmune diabetes (LADA). This type is seen in people who are diagnosed with diabetes as adults but who do not fit the physiological prototype typical of type 2 diabetes. In other words, they may not be overweight and they may have little or no insulin resistance. Nevertheless, they have antibodies that attack their beta cells (the pancreatic cells that make and release insulin). About 15 to 20 percent of people diagnosed with type 2 diabetes could actually have type 1.5.[11]

Maturity onset diabetes of the young (MODY) is a type of diabetes that appears to have a strong genetic link. The characteristics of MODY are similar to those for type 2 diabetes. However, MODY typically develops during the late teens or early twenties, whereas the majority of people with type 2 diabetes tend to be middle-aged or older and overweight.[12]

Pre-diabetes is a relatively new classification of metabolic disorder that is defined as blood glucose levels that are higher than normal but not high enough to meet the criteria for a clinical diagnosis of diabetes. About 41 million people in the U.S. between the ages of 40 and 74 have pre-diabetes.[13] Utah estimates for pre-diabetes have only recently become available and are not included in this report. However, existing survey data indicate that about one in five Utah adults may have pre-diabetes or be at an increased risk for developing it.[14]

Prevalence of Diabetes

Diabetes in the United States

Rates of diabetes have nearly doubled in the past 20 years. [15, 16] Currently, about 14.6 million people in the U.S., or about 5.1 percent of the population, have been diagnosed. An estimated additional 6.2 million Americans have diabetes but have yet to be diagnosed, bringing the total number to over 20 million, or about seven percent of the population.

Each day, approximately 4,000 people in the U.S. are diagnosed with diabetes.[17] A recent study found the risk for children born today particularly alarming. Males born in the U.S. in 2000 face an estimated lifetime risk (between birth and 80 years of age) for developing diabetes of about one in three. For females, the lifetime risk is about two in five. The estimated lifetime risk is particularly high in minority populations regardless of gender.[18]



Diabetes in Utah

Population Demographics

Utah is a western state in the Rocky Mountain region with about 2.5 million residents. The population is predominantly non-Hispanic white. Hispanic/Latino residents make up the largest minority group. The most recent census estimates (using self-reported data) indicate they comprise more than ten percent (10.6%) of the Utah population.[19] The term "Hispanic/Latino" refers to an ethnicity, not a race; therefore, members of the Hispanic/Latino population are also counted in the estimates for each race.

Asian-Americans comprise two percent of the total Utah population. Several other racial subgroups account for less than two percent each: African-Americans (0.9%), American Indians/Alaska Natives (1.3%), and Native Hawaiians/Pacific Islanders (0.7%). Although Native Hawaiians/Pacific Islanders make up only a small percentage of the Utah population, it is noteworthy that Utah ranks (along with Nevada) second in the nation in per capita proportion of Native Hawaiians/Pacific Islanders, exceeded only by Hawaii. Another 1.3 percent belong to two or more races.

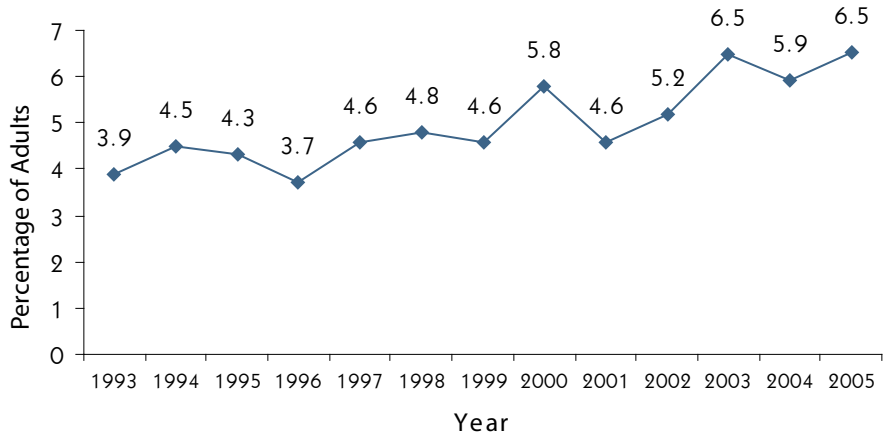
In contrast, in the U.S., only four fifths (80.4%) of the population is white, and 14.1 percent are of Hispanic/Latino ethnicity. The median age in Utah is young--28.0 years--compared to 36.2 years for the U.S. [22] One in twelve (8.7%) Utahns is age 65 or older, compared to one in eight (12.4%) U.S. residents.

Prevalence of Diabetes

A primary source of information on diabetes in Utah comes from the Behavioral Risk Factor Surveillance System (BRFSS), a survey that collects information on adults age 18 and over. As seen in Figure 1, there has been a gradual but consistent increase in the prevalence of diabetes cases between 1993 and 2004. The percentage of Utahns with diabetes increased from 3.9% in 1993 to 6.5% in 2005, an increase in prevalence of 55 percent (NOTE: The rates shown in Figure 1 are age-adjusted. Crude rates are shown in the Appendix).

The Utah Health Status Survey (UHSS) is another source of health information on Utah residents. An estimated 104,000 Utahns, about four percent (4.1%) of the total Utah population, have been diagnosed with diabetes.[20] (NOTE: This number includes Utahns younger than 18). Because children and adolescents are included in the denominator, prevalence of diabetes from this survey is lower than that obtained from surveys that include only adults,

Figure 1. Age-Adjusted Prevalence Rates of Diagnosed Diabetes Among Utah Adults, 1993-2005



Source: BRFSS 1993-2005



such as the BRFSS.

In its earlier stages, diabetes may have no symptoms. Some individuals may unknowingly have diabetes for as long as ten years and are diagnosed only after serious complications have developed. Early detection of diabetes is essential if complications are to be prevented or delayed. Approximately 42,000 Utahns remain undiagnosed despite efforts to encourage early detection.[20]

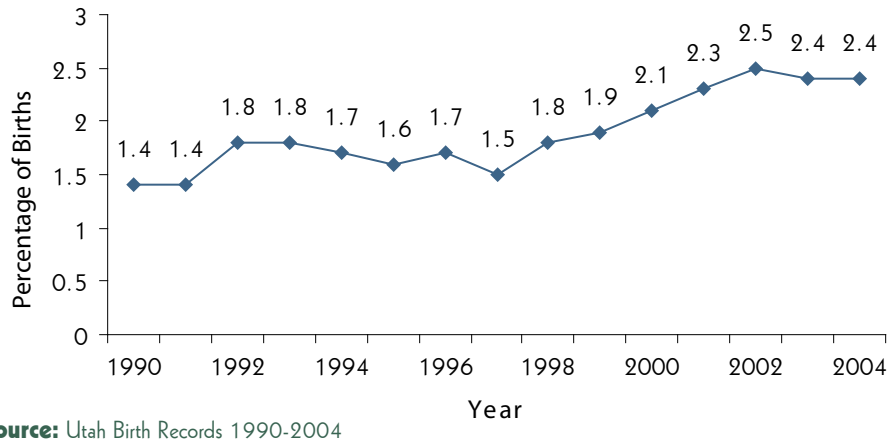
Gestational Diabetes

Gestational diabetes is first identified through tests administered during pregnancy, typically between the 24th and 28th week. Gestational diabetes usually disappears after delivery; nevertheless, it can have serious consequences for both mother and children. A particularly noteworthy study found that the risk of diabetes by young adulthood in children born to mothers with diabetes during pregnancy was nearly four times (3.7 times) that of children who were not exposed to diabetes in utero.[5] There is also emerging evidence that diabetes during pregnancy may even affect future generations. A multigenerational study of rats conducted jointly by the University of Texas Health Science Center at San Antonio and the Institute of Medical Sciences and Nutrition in Mexico City showed that a female rat's diet during pregnancy appears to affect the risk of obesity and insulin resistance in the following generation. The effect is particularly strong for females.[21]

The number of youth who develop diabetes is growing dramatically. While increasingly poor diet and exercise habits among children and youth explain some of the rise in diabetes prevalence, they may not tell the whole story. Exposure to diabetes in utero is emerging as an important risk factor for developing diabetes.

Nationally, about four percent of all pregnancies are affected by gestational diabetes. In Utah, the percentage is well below the national level. Nevertheless, it has increased fairly steadily over the past 15 years, rising from 1.4 percent of all births in 1990 to 2.4 percent of all births in 2004 (Figure 3).

Figure 2. Percentage of Live Births in Utah for Which Mother Had Gestational Diabetes, 1990-2004



Source: Utah Birth Records 1990-2004

Prevalence of Diabetes by Demographic and Socio-economic Characteristics

Demographic Characteristics of Utah Adults with Diabetes

Members of minority racial and ethnic groups tend to have a greater risk of developing diabetes than non-Hispanic whites. In 2001, the overall prevalence of diagnosed diabetes for the state was 3.5 percent (UHSS data from 2001 are used because racial and ethnic groups were sufficient for that year of the survey). The crude prevalence rates of diabetes by race/ethnicity are shown in Figure 3. The highest prevalence of diabetes is seen among Native Americans, where around one in sixteen (6.2%) has been diagnosed. The Pacific Islander population has the second highest prevalence, with about one in 22 (4.5%) diagnosed. The diabetes prevalence rate is roughly comparable among African-Americans (3.7%), Non-Hispanic Whites (3.6%), and Asian-Americans (3.4%). Hispanic/Latino Utahns exhibit the lowest prevalence (2.4%).[20]

Crude rates of diabetes mask some of the differences in prevalence among minority subgroups, given that their populations are generally younger and diabetes prevalence is lower among the young. Another matter is the problem of undiagnosed diabetes and the degree to which there may be ethnic differences in the prevalence of having undiagnosed diabetes. For example, nationally, members of the Hispanic/Latino population, particularly those 40 and over, have high rates of undiagnosed diabetes. Data from the Third National Health and Nutrition Examination Survey, 1988-1994 (NHANES III) show that 20.2 percent of Hispanic/Latino Americans between the ages of 40 and 74 had undiagnosed diabetes, compared to 6.7 percent for the total population.[22] The low crude rates observed in the Hispanic/Latino population may be partly due to a high level of undiagnosed diabetes in addition to having a relatively young population.

In order to refine the comparisons of prevalence across racial/ethnic groups, age-adjusted rates, standardized to the U.S. 2000 population, are also shown (Figure 4). It is important to remember that age-adjusted rates are artificial rates that take into account the

Figure 3. Crude Percentage of Utahns With Diabetes by Race/Ethnicity

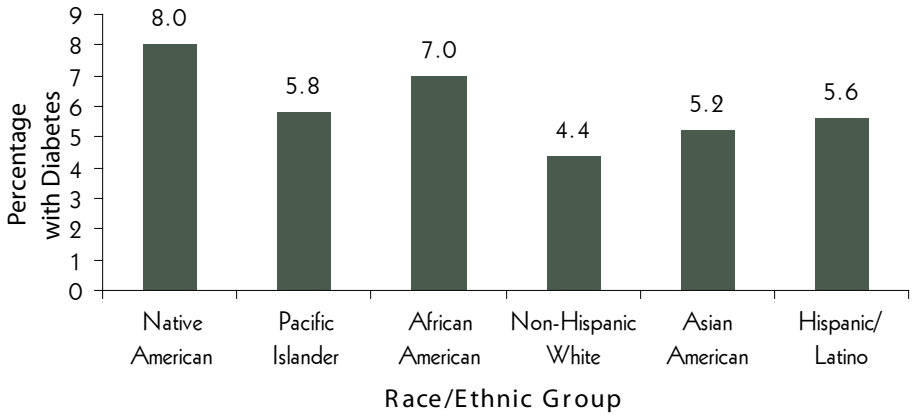
Source: Utah Health Status Survey 2001



effect of different age compositions among populations being compared. Because of the high prevalence of diabetes among the older age groups in Utah, age adjusting boosts the overall rate for the state from 3.5 percent to 4.5 percent.

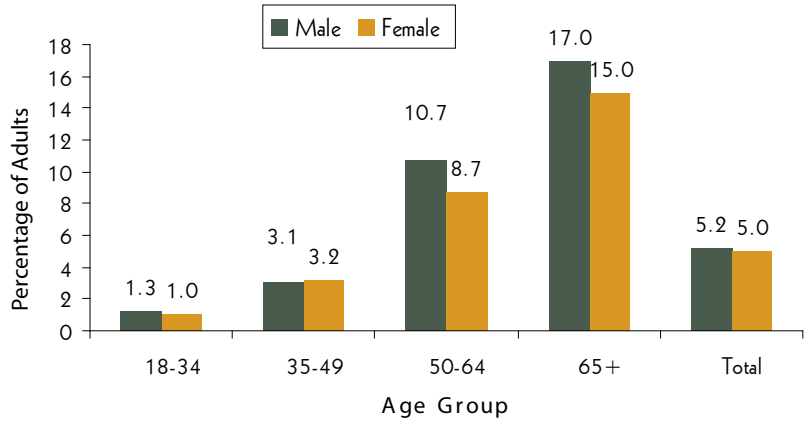
With age adjustment, all racial/ethnic minority groups exhibit a higher prevalence of diabetes than is observed for non-Hispanic whites. The percentage differences between the various minority groups and non-Hispanic whites generally increase with age adjustment, suggesting that their generally younger populations mask relatively higher non-age-related risk differences. A particularly interesting case is that of the Hispanic/Latino population, which has a higher age-adjusted percentage with diabetes than non-Hispanic whites, a pattern opposite of that observed with the unadjusted percentages. Nevertheless, the relative ordering of adjusted percentages among the various minority subgroups remains generally the same as the unadjusted percentages.

Figure 4. Age-Adjusted Percentage of Utahns With Diabetes by Race/Ethnicity



Source: Utah Health Status Survey 2001

Figure 5. Age-Adjusted Percentage of Utah Adults With Diabetes by Age and Gender



Source: BRFSS 2003-2005

Age, Gender and Prevalence of Diabetes

As seen in Figure 5, based on three years of combined BRFSS data, there are considerable differences in the prevalence of diabetes across age groups. The pattern is similar for males and females, although the prevalence is slightly higher for males in every age group. The most pronounced difference is seen in the 50 to 64 year age group (11.3% vs. 8.7%).

Diabetes in Youth

Diabetes is relatively uncommon in individuals younger than age 20. Nationally, about three out of 1,000 youths under the age of 20 (0.3%), or about 210,000 youths, have diabetes.[23] In Utah, the estimated percentage is slightly higher. About four out of 1,000 (0.4%), or around 4,000 youth under 20, have diabetes.[20]

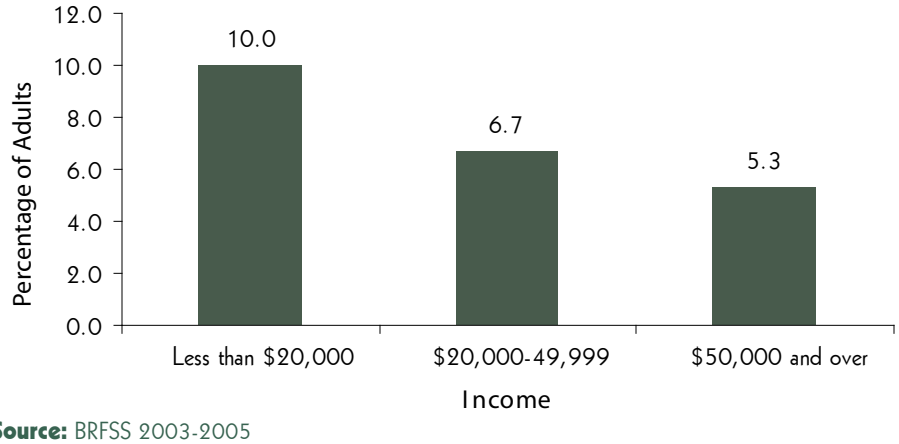
The majority of youth with diabetes have type 1.[24] Incidence of type 1 diabetes peaks around the age of puberty, but national data indicate that in recent years, the greatest increase has been seen in children under the age of five.[24] There is an alarming increase in the number of youth with type 2 diabetes that, until recently, was rarely seen until middle or late adulthood.[26] Some studies suggest that, in some groups, as many as 45 percent of new cases of diabetes in youth are type 2.[25] This growing prevalence is directly linked to the increasing youth obesity rates. Nationally, the prevalence of overweight in adolescents has nearly tripled in the past two decades.[28]

The same risk factors for type 2 diabetes in adults apply to youth. Family history of type 2 diabetes in a first- or second-degree relative, insulin resistance, and race or ethnicity (Native American, African-American, Hispanic/ Latino, Asian, Pacific Islander) are risk factors.[1] Lack of physical activity and high-fat diets have also contributed to this increase, primarily because of their relationship to obesity. Because diabetes is a progressive disease, the increasingly earlier onset is likely to result in higher complication rates in the future as more people with diabetes live a greater proportion of their lives at risk for its serious consequences.

Socioeconomic Characteristics and Prevalence of Diabetes

Socioeconomic status is associated with many aspects of health, including insurance coverage, access to preventive services, perceptions of health, and participation in health-promoting behaviors. Occupying lower socioeconomic status may impair the ability to adopt lifestyles optimal for good health. Also, individuals in poor health may drift down to lower levels of income and occupation. The relationship between low socioeconomic status and prevalence of diabetes is well established.[27] Therefore, one would expect to see a higher prevalence of diabetes in populations at the lower end of the socioeconomic spectrum. BRFSS data support this reasoning.

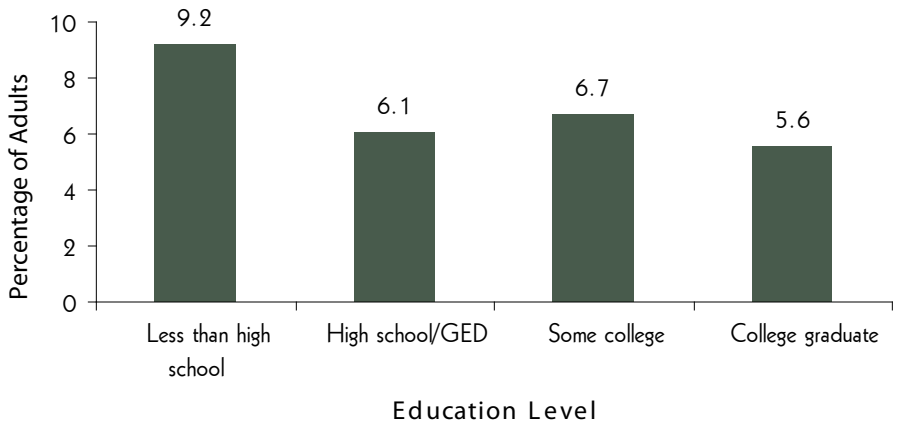
Figure 6. Age-Adjusted Percentage of Utah Adults With Diabetes by Annual Household Income



Source: BRFSS 2003-2005



Figure 7. Age-Adjusted Percentages of Utah Adults With Diabetes, by Education

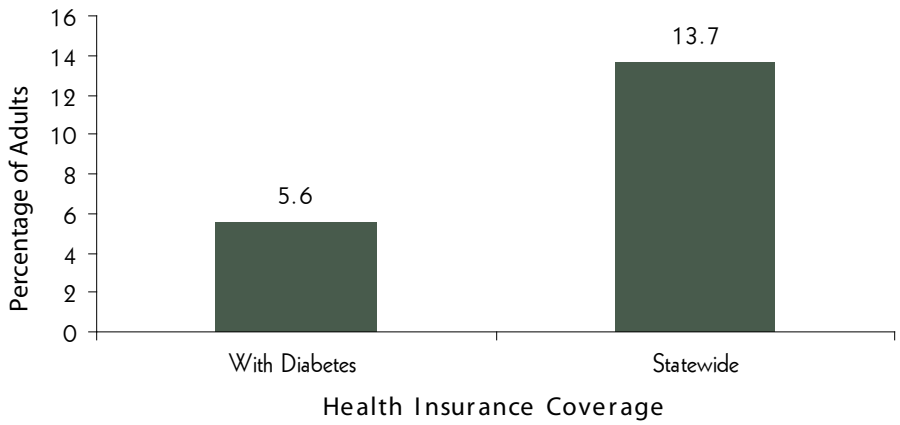


Source: BRFSS 2003-2005

The prevalence of diabetes among Utah adults residing in households with incomes under $20,000 annually is one and one-half times that of their counterparts in households with annual incomes $20,000-$49,999 (10.0 % vs. 6.7%) and nearly twice as high as adults in households with annual incomes of $50,000 or more (10.0% vs. 5.3%). (See Figure 6). The same pattern of socioeconomic status gradient is observed for the association between education and diabetes (See Figure 7). The highest prevalence of diabetes is seen among Utah adults who have less than a high school degree, where about one of eleven (9.2%) adults has diabetes. The lowest prevalence is seen among college graduates, where about one of 20 (5.6%) adults has been diagnosed.

Health Insurance Coverage for Utah Adults With and Without Diabetes

Figure 8. Age-Adjusted Percentages of Utah Adults Without Insurance Coverage: With Diabetes and Statewide



Source: BRFSS 2003-2005

National data suggest that the average cost of diabetes care per person exceeds $13,000 a year.[4] Obtaining adequate diabetes care can be difficult without insurance coverage. Figure 8 displays the percentage of Utah adults without health insurance coverage by whether or not they have diabetes. Because health insurance coverage may be linked to age, and people with diabetes tend to be older and eligible for Medicare, age-adjusted rates are used to compare the two groups. In Utah, more than one in

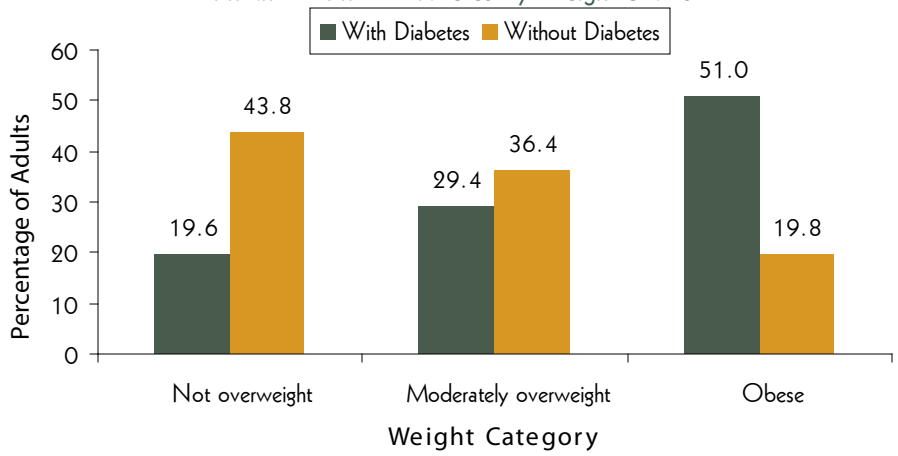
seven (15.7%) of all Utah adults have no health insurance coverage. The proportion is slightly lower among adults with diabetes, at one in ten (9.7%). This percentage translates into approximately 10,000 adults with diabetes having no insurance to assist them with the medical expenses necessary for optimal care.

Among uninsured adults in Utah, the prevalence of diabetes is much lower than it is for the adult population as a whole (9.7% vs. 15.7%). Ironically, the uninsured population exhibits relatively lower diabetes prevalence despite their greater likelihood having many more of the socio-demographic risk factors for diabetes (e.g., low income and low education levels) than the insured population. The relatively lower prevalence rate suggests that a number of Utah adults without insurance and related access to health care services may have diabetes but are not diagnosed. This issue suggests a serious public health problem that must be addressed. Delayed detection of diabetes may lead to complications that could be averted with an early diagnosis.

Lifestyle Characteristics for Utah Adults With and Without Diabetes

The positive association between body weight and diabetes is well known. A commonly used measure of weight status is body mass index (BMI). Moderately overweight is defined as having a BMI between 25 and 29.9 kg/m2. Obesity is defined as having a BMI of 30 kg/m2 or higher. In Utah, only about one in five adults (19.6%) with diabetes is not overweight compared to two of five adults (43.8%) without diabetes. Adults without diabetes have a slightly higher prevalence of being moderately overweight than those with diabetes (36.4% vs. 29.4%). The real difference is observed in the prevalence of obesity. More than half (51.0%) of adults with diabetes are obese, compared to less than one-fifth (19.8%) without diabetes (Figure 9).

Figure 9. Age-Adjusted Percentages of Utah Adults, With and Without Diabetes by Weight Status

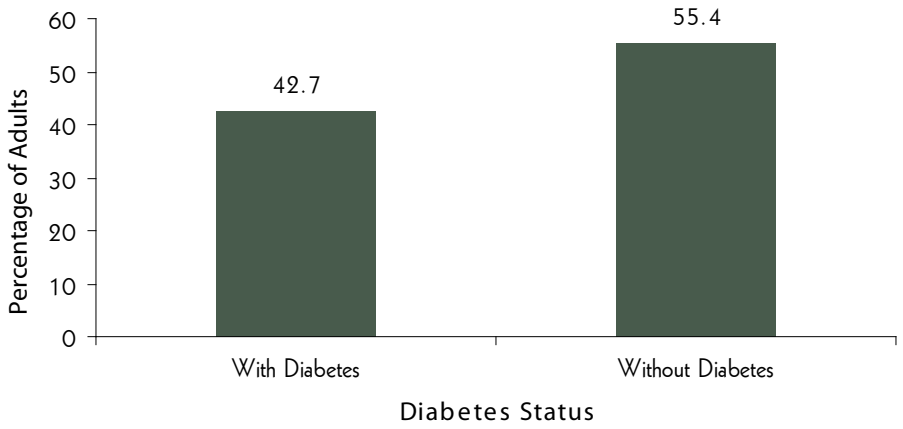


Source: BRFSS 2003-2005

Differences in the percentages of Utah adults with and without diabetes who obtain the recommended level of physical activity (defined as having light or moderate physical activity for at least 30 minutes five times a week or vigorous activity for at least 20 minutes three times a week) are noteworthy. More than one-third (42.7%) of Utah adults

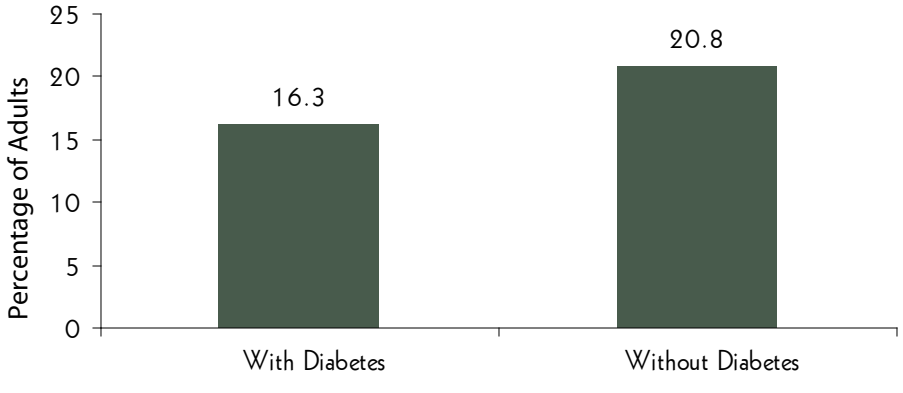


Figure 10. Age-Adjusted Percentages of Utah Adults, With and Without Diabetes, Who Engage in Leisure-Time Physical Activity



Source: BRFSS 2003-2005

Figure 11. Age-Adjusted Percentages of Utah Adults, With and Without Diabetes, Who Meet the Recommended Nutrition Guidelines



Source: BRFSS 2003-2005
Note: Recommended guidelines are defined as having 5 or more servings of fruits and vegetables a day

with diabetes participate in leisure time physical activity, compared to over half (55.4%) of their counterparts without diabetes (Figure 10).

The percentages of Utah adults who obtain the recommended five servings of fruits and vegetables a day is rather discouraging, whether or not they have diabetes.[14] Just over one in three (16.3%) adults with diabetes consumed the recommended number of servings, compared to one in five adults (20.8%) without diabetes (Figure 11).



Section Two Diabetes and Medical Care

Adequate diabetes management requires regular and effective health care. Routine physician visits (at least annually) and clinical exams are important for early detection and treatment of complications. Data from BRFSS are used to examine care obtained by Utah adults with diabetes (NOTE: Three years of data are combined to provide the most reliable estimates. Rates are age-adjusted to facilitate comparisons of differences across groups that exist over and above the effect of age).

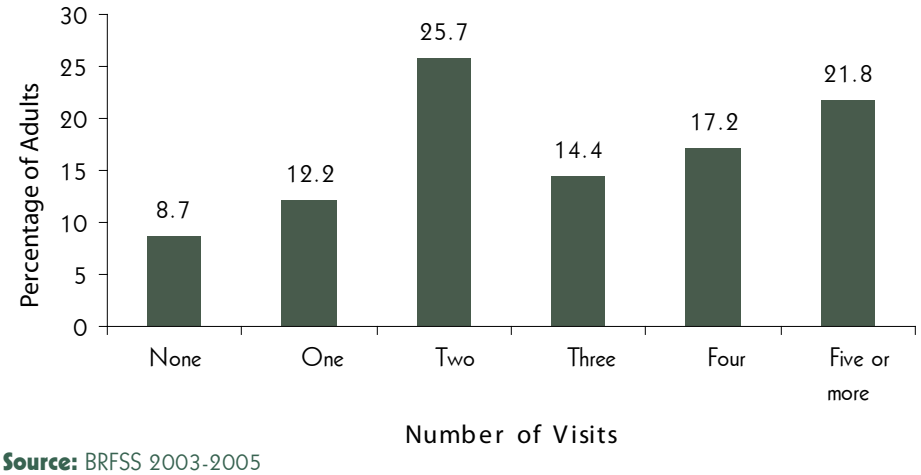
Physician Visits

Nearly all (91.3%) Utah adults with diabetes reported having seen a doctor, nurse, or other health care professional for their diabetes at least once in the past 12 months. The modal (most frequently occurring) number of reported visits to a health care provider was two visits a year, representing one in four (25.7%) adults with diabetes (Figure 12). Just over one-fifth (21.8%) had five or more annual physician visits for their diabetes.

Clinical Exams

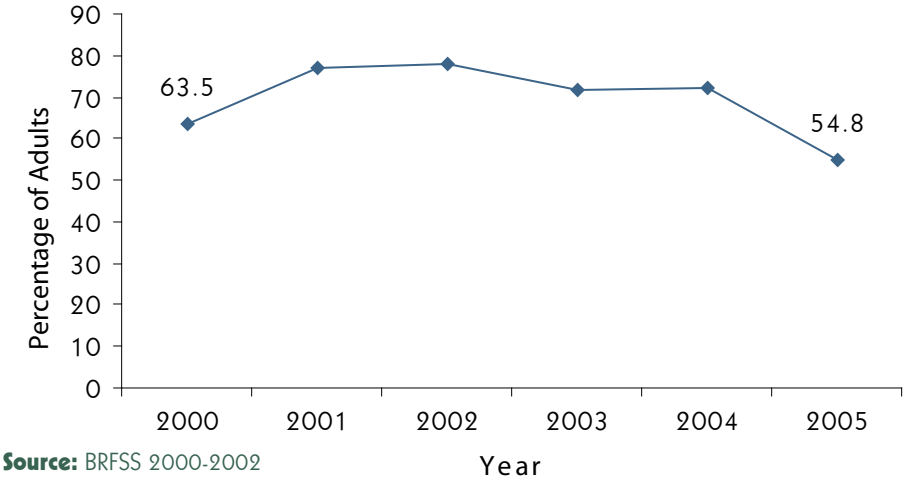
The gold standard of diabetes control is the A1C exam. The A1C exam (sometimes called glycosolated hemoglobin or hemoglobin A1C) measures the average level of glucose in the blood over the prior three months. The American Diabetes Association (ADA) recommends having an A1C exam at least twice a year. Most health care professionals recommend more frequent

Figure 12. Age-Adjusted Rates of Number of Physician Visits in Past 12 Months Reported by Utah Adults With Diabetes



Source: BRFSS 2003-2005

Figure 13. Age-Adjusted Percentage of Utah Adults With Two or More A1C Exams in Past Year, 2000-2005



Source: BRFSS 2000-2002



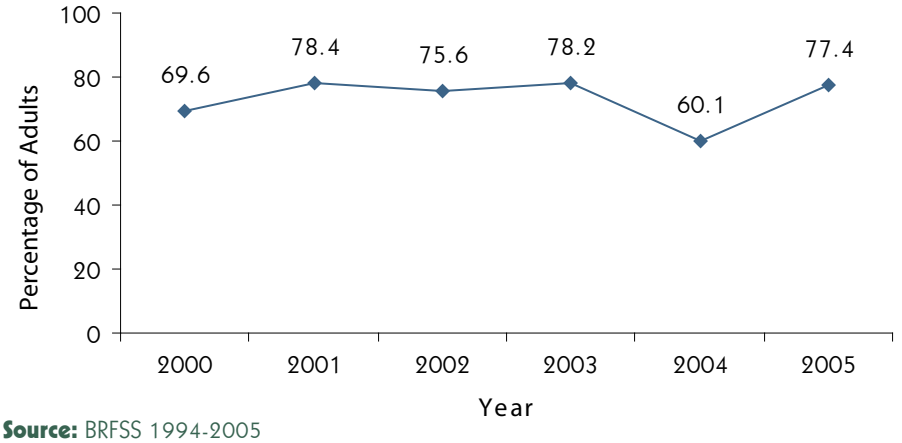
exams, three or four times a year, for people on insulin.[28] As noted in the Utah Diabetes Practice Recommendations, health experts also recommend a target A1C level of less than 7.0 percent, or as close to normal (less than 6 percent) as possible without causing significant hypoglycemia.[29]

In Utah, the majority of adults with diabetes report having at least two A1C exams a year. The percentages in Figure 13 illustrate the trend over time, showing an increase from 63.5 percent in 2000 to 78.2 percent in 2002, followed by a decline to 54.8 percent in 2005.

Regular comprehensive foot exams conducted by a health care professional are an essential part of diabetes management that can substantially reduce the risk of lower extremity amputation. Healthy People 2010 Objective 5-14 underscores the importance of increasing the proportion of people with diabetes who have at least one professional foot exam annually. National estimates indicate that only about 55 percent of people with diabetes have an annual foot exam.[30] In Utah, the percentage is higher. About three fourths (77.4%) of adults with diabetes report having had a professionally conducted foot exam in the past 12 months (Figure 14).

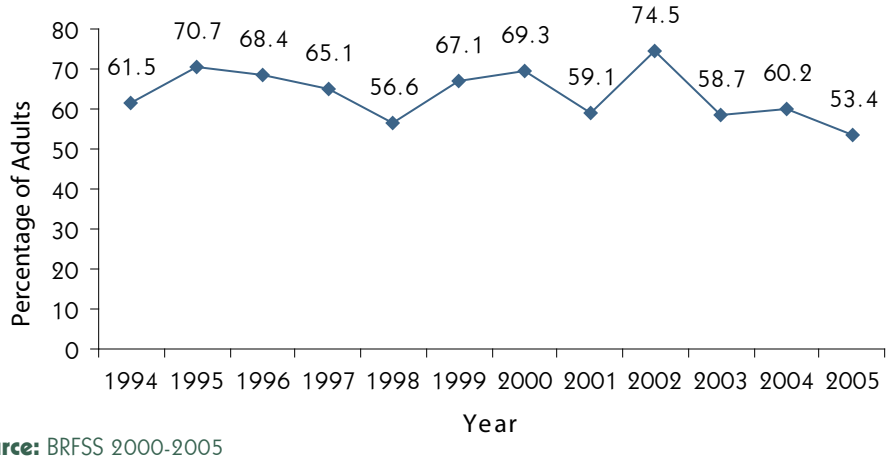
Nationally, about 62 percent (61.9%) of people with diabetes have a dilated eye exam once a year.[31] The percentage is lower in Utah; about half (53.4%) of adults with diabetes have an annual eye exam (Figure 15).

Figure 14. Age-Adjusted Percentage of Utah Adults Who Had a Professional Foot Exam Within Past 12 Months, 1994-2005



Source: BRFSS 1994-2005

Figure 15. Age-Adjusted Percentage of Utah Adults Who Had a Dilated Eye Exam Within Past 12 Months, 2000-2005



Source: BRFSS 2000-2005

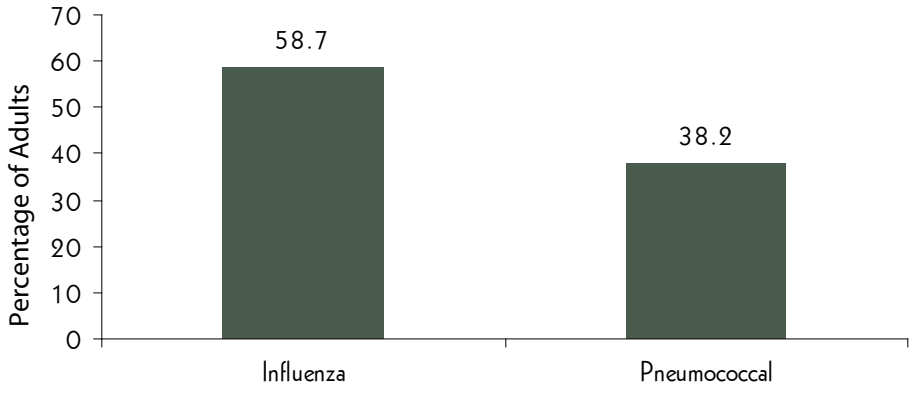
Hospitalization rates for influenza or pneumonia are higher for people with diabetes than for those without the disease.[34] Diabetes nearly triples the risk of dying from complications of flu and pneumonia. Between 10,000 and 30,000 people with diabetes in the U.S. die from complications every year. Therefore, it is recommended that people with diabetes have an influenza vaccination annually and a pneumococcal vaccination at least once by age 65. If a pneumococcal vaccination was obtained prior to age 60, a second one is recommended after age 65.[32]

Nationally, less than half of adults with diabetes report having obtained either of the recommended vaccinations. The most recent data indicate that only 46 percent (45.9%) of U.S. adults obtain an annual influenza vaccination, and about one third (38.9%) have ever had a pneumococcal vaccination.[33] In Utah, fewer than three of five (58.7%) adults with diabetes reported having had a flu vaccination within the prior 12 months. Well under half (38.2%) reported having had at least one pneumococcal vaccination in their lifetime (Figure 16).

HP 2010 OBJECTIVE 5-14 Increase the proportion of adults with diabetes who have at least an annual foot examination.

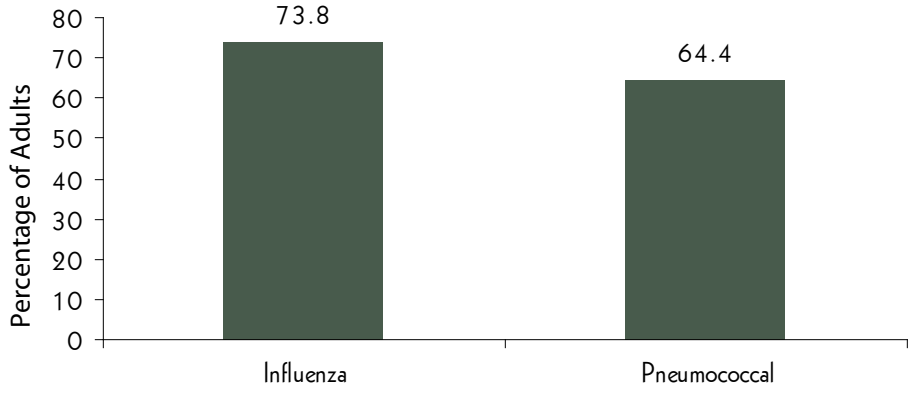
HP 2010 OBJECTIVE 5-13 Increase the proportion of adults with diabetes who have an annual dilated eye examination.

Figure 16. Age-Adjusted Percentage of Utah Adults With Diabetes Who Have Had Recommended Vaccinations for Flu and Pneumonia



Source: BRFSS 2003-2005
Note: Influenza vaccination is in the past 12 months; pneumococcal vaccination is at least once in lifetime

Figure 17. Age-Adjusted Percentage of Utah Adults With Diabetes, Aged 65 and Over, Who Have Had Recommended Vaccinations for Flu and Pneumonia



Source: BRFSS 2003-2005
Note: Influenza vaccination is in the past 12 months; pneumococcal vaccination is at least once in lifetime



The vaccinations may be particularly critical for older adults with diabetes. Among Utah adults aged 65 and over, vaccination rates are higher regardless of diabetes status. Nearly three fourths (73.8%) of Utah adults aged 65 and over with diabetes had obtained an influenza vaccination in the prior 12 months (Figure 16). About three fifths (64.4%) of adults with diabetes age 65 or over had been vaccinated for pneumonia at least once in their lifetime. (Figure 17).

Section Three
Self-Management Techniques

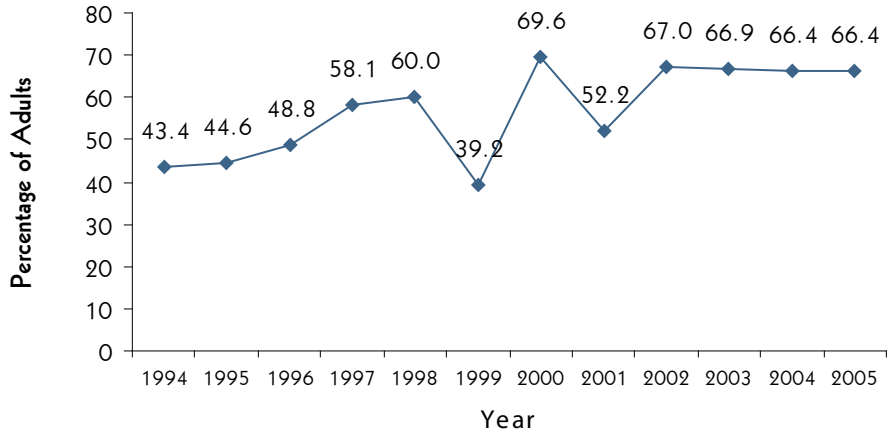
Regular monitoring of blood sugar levels plays an essential role in regulating blood glucose and reducing complications. Two groundbreaking clinical trials, the Diabetes Control and Complications Trial (DCCT) and the U.K. Prospective Diabetes Study (UKPDS), demonstrated that improvements in glycemic control can significantly reduce the risk of microvascular complications in people with diabetes.[34, 35] Findings from a more recent study, the Epidemiology of Diabetes Interventions and Complications (EDIC), a follow-up study to the DCCT, found that intensive glucose control can also cut the risk of heart disease and stroke in half among people with type 1 diabetes.[36]

The American Diabetes Association recommends that most people with type 1 diabetes, and pregnant females on insulin, test their blood glucose levels at least three times a day.[37] The optimal frequency is less clear for people with type 2 diabetes, although monitoring should be conducted often enough for them to attain their glucose goals, especially those on oral medications. In general, people with type 2 diabetes who use insulin typically need more frequent testing than people with type 2 diabetes who don't use insulin. The percentage of Utah adults with diabetes who monitor their blood glucose levels at least once a day has risen fairly substantially over the past decade. In 1994, less than half (43.4%) of adults with diabetes checked their blood glucose levels at least once a day. The percentage has remained fairly stable since 2002 at about 67 percent (Figure 18).

Checking feet regularly for infections, blisters, pressure spots, and loss of sensation can help prevent foot ulcers as well as reduce the risk of lower extremity amputations. About one in eight (11.8%) adults with diabetes in the U.S. have had at least one foot ulcer.[37]

In Utah, the percentage is roughly similar. Approximately one in nine (11.0%) Utah adults with diabetes reported having sores or irritations on their feet that took more than four weeks to heal.[14] (See Figure 25 in next section).

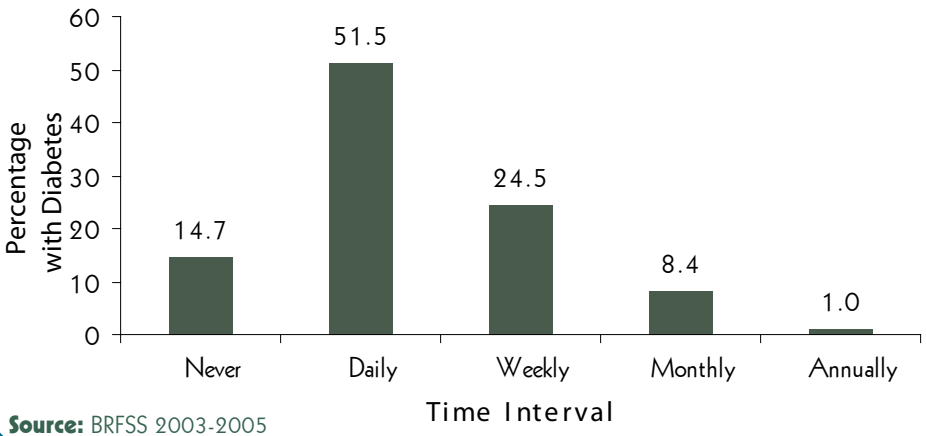
Figure 18. Age-Adjusted Percentage of Utah Adults With Diabetes Who Checked Their Blood Glucose Levels at Least Once a Day, 1994-2005



Source: BRFSS 1994-2005

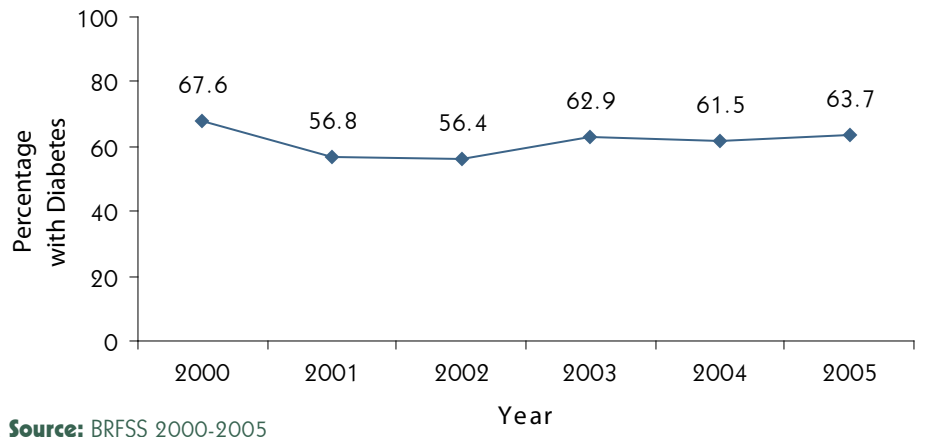


Figure 19. Age-Adjusted Percentage of Utah Adults With Diabetes Who Checked Their Feet, by Frequency



Source: BRFSS 2003-2005

Figure 20. Age-Adjusted Percentages of Utah Adults With Diabetes Who Have Ever Taken a Course or Class in Diabetes Self-Management, 2000-2005



Source: BRFSS 2000-2005

HP 2010 OBJECTIVE 5-1 Increase the proportion of persons with diabetes who receive formal diabetes education.

People with diabetes should be especially diligent about checking their feet daily for sores if they are over age 40, have had diabetes more than ten years, have poor glucose control, have cardiovascular, renal or eye complications, have a history of neuropathy, peripheral vascular disease, or have previously had foot problems.[39]

Over half of Utah adults with diabetes (51.5%) reported checking their feet for sores or blisters daily (Figure 19). Just under one in four (24.5%) reported checking their feet about once a week, and about one in 11 (8.4%) reported checking their feet on a monthly basis. About one in seven (14.7%) reported never checking their feet.

Diabetes self-management education is an essential component of comprehensive diabetes care. Diabetes education has been shown to increase the frequency and accuracy with which patients participate in monitoring blood glucose levels and their commitment to following meal plans, at least for the short term (up to six months after completing a course).[40] The U.S. Department of Health and Human Services, as part of the Healthy People 2010 objectives, has established a national objective to increase the proportion of persons with diabetes who receive formal diabetes education (Healthy People 2010 Objective 5-1).

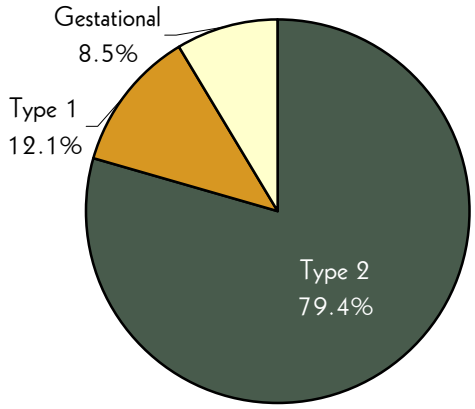
Nevertheless, despite the widely recognized value of diabetes education, just over half (56.6%) of U.S. adults with diabetes report they have ever had diabetes education.[41] Utah data show little variation in the percentage of adults who have had a course since 2000, the first year this information was tracked with BRFSS. The proportion of adults with diabetes who have had an education course has been roughly three fifths of adults at any time during the five-year period (Figure 20).

There are 46 diabetes education sites in Utah (at the time of this report) that are certified by either the American Diabetes Association (ADA) or the Utah Diabetes Prevention and Control Program (DPCP) or both. Sixteen of the programs are certified by the DPCP, eight of which also have ADA recognition. As part of the DPCP certification process, programs submit annual reports on the percentage of clients meeting clinical targets, which include A1C exams, lipid profiles, and blood pressure control. A brief overview of the outcomes of the state-certified programs is presented in this section.

The latest available data (2004) indicate that about four in five (79.4%) clients in state-certified diabetes self-management training programs had type 2 diabetes, while about one in eight (12.1%) clients had type 1 (Figure 21). Around one in 12 (8.5%) clients had gestational diabetes.

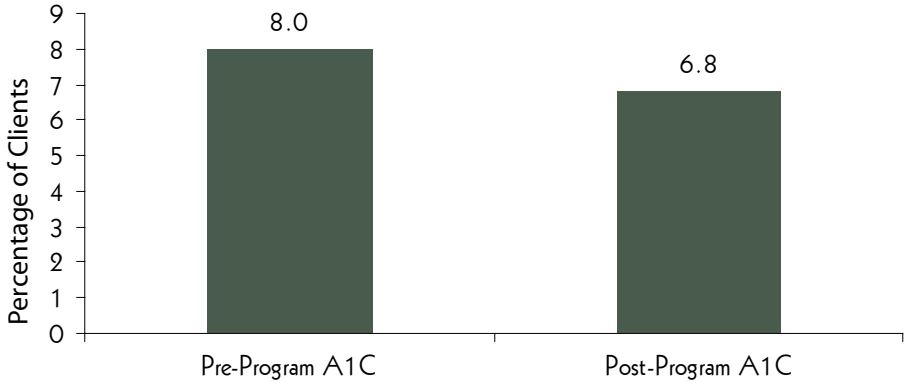
Clients who participate in a state-certified course clearly demonstrate improvement in hemoglobin A1C levels.

Figure 21. Percentage Distribution of Diabetes Education Clients by Type of Diabetes



Source: Utah State-Certified Programs Reports 2004

Figure 22. Pre- and Post-Program A1C Levels for Clients Completing a Self-Management Course

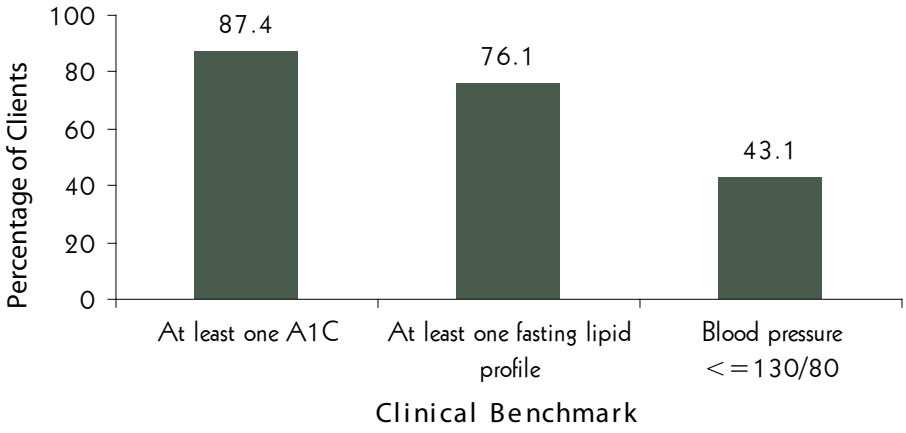


Source: Utah State-Certified Programs Reports 2004



The A1C levels in Figure 22 are based on a sample size of 1,282 clients for whom pre-course and post-course A1C levels were available. The average A1C level for clients prior to beginning a self-management training course was 8.0 percent. The average level for clients after course completion was 6.8 percent, a 15 percent decline, which meets the recommended target of less than seven percent.

Figure 23. Percentage of Clients Reaching Recommended Clinical Benchmarks



Source: Utah State-Certified Programs Reports 2004

As seen in Figure 23, seven of eight clients (87.4%) who completed a state-certified diabetes education course had at least one A1C exam during the year. More than three fourths (76.1%) of the clients had at least one lipid profile. Fewer than half (43.1%) of the education clients achieved the recommended blood pressure level of less than 130/80 mm Hg.

Morbidity Section Four

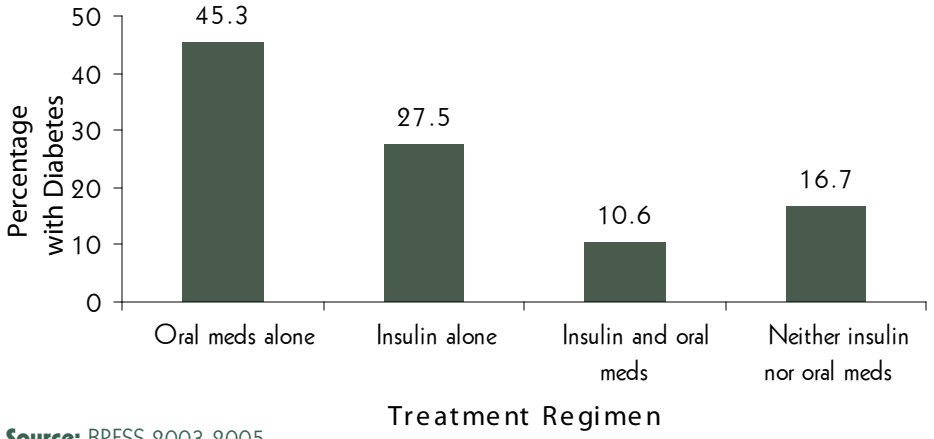
Diabetes Treatment Modalities

BRFSS data were used to assess the treatment methods adults used to manage their diabetes. More than two fifths (45.3%) of Utah adults with diabetes reported using oral medications alone to manage their diabetes, while more than one in four (27.5%) used insulin alone to manage their diabetes (Figure 24). Individuals on insulin included all adults with type 1 diabetes, but it should also be noted that insulin is commonly used to treat people with type 2 diabetes, particularly those with hard-to-control type 2. About one in ten (10.6%) adults use both oral medications and insulin. Nearly one in six (16.7%) adults with diabetes did not use any pharmaceutical intervention to control the disease.

A key objective noted in Healthy People 2010 refers to the importance of decreasing the prevalence of foot ulcers among people with diabetes. In Utah, about one in seven (14.0%) adults with diabetes reported having foot ulcers. Prevalence of foot ulcers is obtained through a proxy measure of having sores or irritations that take longer than four weeks to heal (Figure 25).

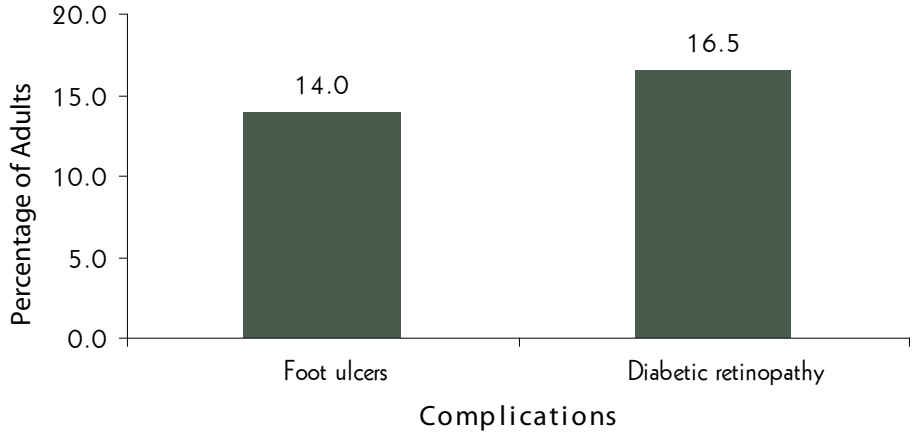
HP 2010 OBJECTIVE 5-9 (Developmental)
Reduce the frequency of foot ulcers in persons with diabetes.

Figure 24. Age-Adjusted Percentages of Various Treatment Regimens Used by Adults With Diabetes



Source: BRFSS 2003-2005

Figure 25. Age-Adjusted Percentages of Utah Adults With Diabetes Reporting Complications



Source: BRFSS 2003-2005

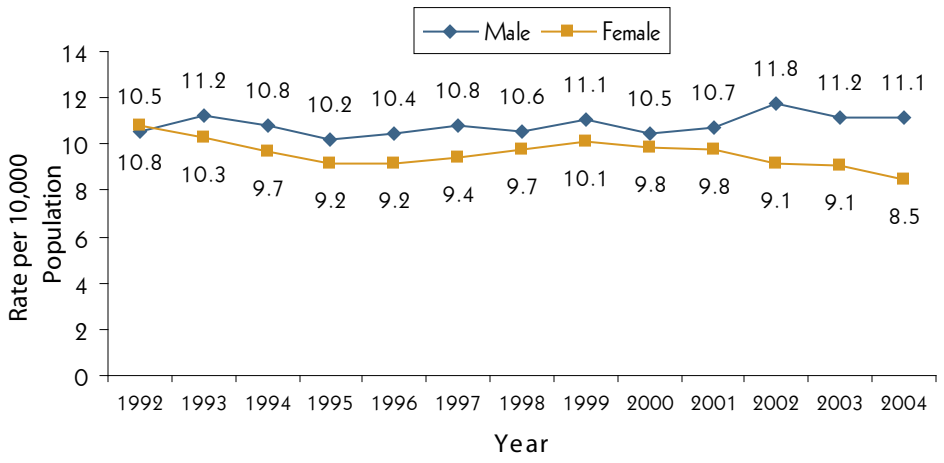


Table 1. Numbers, Crude, and Age-Adjusted Rates of Inpatient Hospital Discharges Listing Diabetes as Primary Diagnosis per 10,000 Utah Residents, Utah Inpatient Hospital Discharge Database, 1995- 2004

Year	Number of Discharges	Crude Rate	Age-Adjusted Rates
1995	1,616	8.1	9.4
1996	1,688	8.3	9.4
1997	1,785	8.5	10.9
1998	1,839	8.6	10.6
1999	1,960	8.9	10.4
2000	1,971	8.8	10.0
2001	2,048	8.9	10.1
2002	2,128	9.0	10.2
2003	2,128	8.8	9.9
2004	2,081	8.4	9.5

*Age-adjusted to U.S. 2000 Population using four age categories

Figure 26. Age-Adjusted Hospital Discharge Rates in Utah for Diabetes as Primary Diagnosis by Gender, 1992-2004



Source: Utah Inpatient Hospital Discharge Database 1992-2004

Retinopathy is a serious condition that occurs when blood vessels at the back of the eye swell or proliferate. It can result in blindness if the swollen vessels rupture. Nearly one in seven (15.3%) Utah adults with diabetes reported having diabetic retinopathy (Figure 25).

Hospitalizations for Utahns With Diabetes

Hospitalization costs make up a major proportion of the total costs of diabetes. The American Diabetes Association estimates that approximately 44 percent of all direct medical costs for diabetes are due to hospitalization.[4]

The numbers and rates (crude and age-adjusted) for hospitalizations occurring between 1992 and 2005 in Utah where diabetes is listed as the primary diagnosis are shown in Table 1.

The number of hospital discharges listing diabetes as a primary diagnosis has increased gradually over the fourteen-year period, but there has been little change in either the crude or age-adjusted rates. Because diabetes prevalence has increased, the lack of increase in the population at large in the hospitalization rate is intriguing. This phenomenon could reflect the increasing number of diabetes-related procedures being done on an outpatient basis and/or improvements in primary care that result in lower risk of hospitalization. Nevertheless, diabetes remains a major cause of hospitalization.[41]

There does not appear to be a significant



discrepancy in rates of hospital discharges by gender. The trends in age-adjusted rates for hospitalization for diabetes as the primary diagnosis for males and females are shown in Figure 26. The rate of hospital discharge for males has consistently been slightly higher than that for females, and the differential has widened only slightly since 2001.

Discharge Rates for Diabetes as Primary Diagnosis and Related Complications

The numbers, crude rates, and age-adjusted rates for major diabetes conditions as a diagnosis listed on hospital discharge records are shown in Table 2. The specific definition of each condition is contained in the notes at the bottom of the table.

Table 2. Numbers, Crude, and Age-Adjusted Rates of Diabetes as Primary Diagnosis Discharges per 10,000 Utah Residents, Utah Inpatient Hospital Discharge Database, 2004

Complication	Number of Discharges	Crude Rate	Age-Adjusted Rate*
Primary Diagnosis	2,081	8.4	10.4
Major Cardiovascular Disease	5,364	21.7	30.3
Renal Disease, Kidney Transplant or Hemodialysis	1,695	6.8	9.1
Acute Metabolic Complications	791	3.2	4.0
Ophthalmic Manifestations	772	3.1	4.0
Lower-Extremity Amputation	276	1.1	1.5

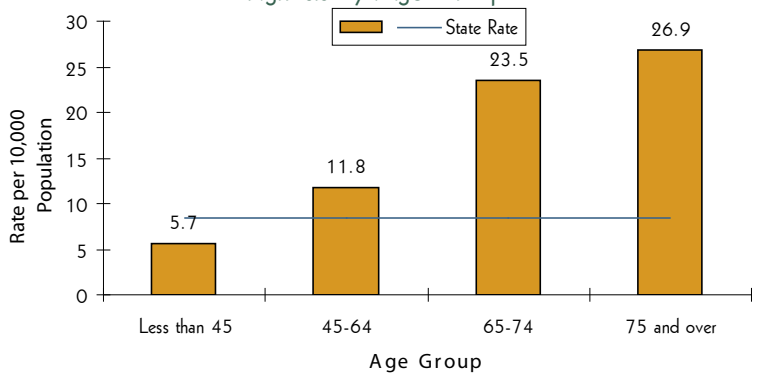
*Age-adjusted to U.S. 2000 Population using four age categories
1st listed ICD-9-CM 250 for primary diagnosis of diabetes
Hospitalizations for major cardiovascular disease include those discharges with any major cardiovascular condition as the primary diagnosis and diabetes as a contributing diagnosis
Any listed ICD-9-CM 250.4 OR any listed ICD-9-CM 250 with procedure codes 55.6 (renal transplant) or 39.95 (hemodialysis) for renal disease, kidney transplant, or hemodialysis
ICD-9-CM 250.1 (ketoacidosis), 250.2 (hyperosmolar coma), or 250.3 (other coma) a primary diagnosis for acute metabolic complications
ICD-9-CM 390-448 as primary diagnosis and any listed ICD-9-CM 250 for major cardiovascular disease.
Any listed ICD-9-CM 250.5 for ophthalmic manifestations
Any listed ICD-9-CM 250 with a procedure code 84.1 for nontraumatic amputation of lower limb (NOT 895-897 for traumatic amputation)
Note: Conditions are not mutually exclusive

It is important to note that cardiovascular conditions have the highest crude and age-adjusted rates, 21.7 and 30.3 per 10,000 Utah residents, respectively. These rates are well above the rates for diabetes as a primary diagnosis (with a crude rate of 8.4 per 10,000 residents and an age-adjusted rate of 10.4). The third highest rate is for kidney problems (which can include kidney disease, kidney transplant, or dialysis) at 6.8 per 10,000 residents. Rates for kidney problems refer primarily to inpatient hospitalizations for acute conditions and do not reflect treatment that is done on an outpatient basis (e.g., dialysis).

Acute complications include ketoacidosis, hyperosmolar coma, or other coma. Most of the discharges for acute complications were for ketoacidosis, a condition that occurs when blood sugar levels rise to a dangerously high level. The lowest rates are seen for hospital discharges for lower-extremity amputations, with a crude rate of 1.1 per 10,000 Utahns and an age-adjusted rate of 1.5 per 10,000 Utahns. An additional 100 to 150 minor amputations are done on an outpatient basis each year and are not included in these numbers.

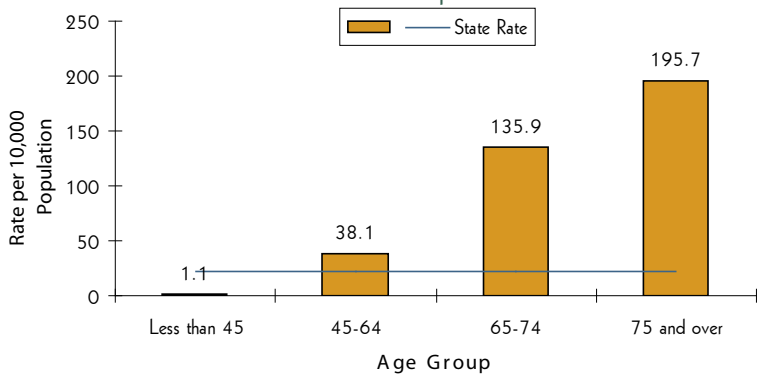


Figure 27. Age-Specific Rates of Hospital Discharge for Diabetes as Primary Diagnosis by Age Group



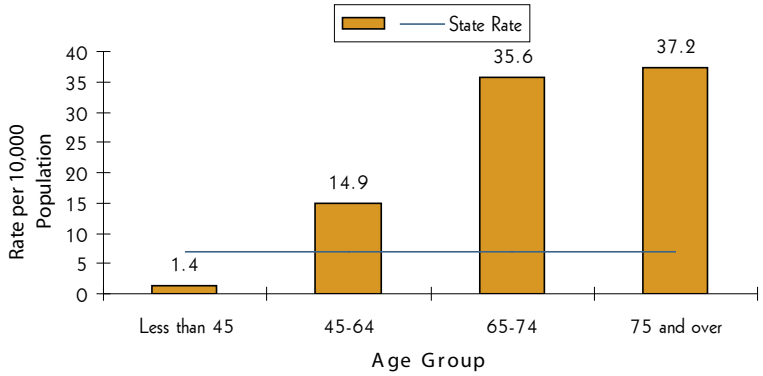
Source: Utah Inpatient Hospital Discharge Database 2004

Figure 28. Age-Specific Rates of Hospital Discharge for Diabetes-Related Cardiovascular Complications



Source: Utah Inpatient Hospital Discharge Database 2004

Figure 29. Age-Specific Rates of Hospital Discharge for Diabetes-Related Renal Complications



Source: Utah Inpatient Hospital Discharge Database 2004

Age-Specific Hospital Discharge Rates

In order to more closely understand the hospital discharge profile of Utahns with diabetes, it is important to look at rates by age group. The following graphs (Figures 27-33) show the age-specific rates of hospital discharge for diabetes as a primary diagnosis and its related complications. The horizontal bar in each graph depicts the overall rate for the state among all people with diabetes.

As may be expected, rates for diabetes as primary diagnosis rise steadily with age (Figure 27). The discharge rate for people 75 and over is nearly five times that for people under age 45 (26.9 per 10,000 Utahns age 75 and older vs. 5.7 per 10,000 Utahns less than age 45).

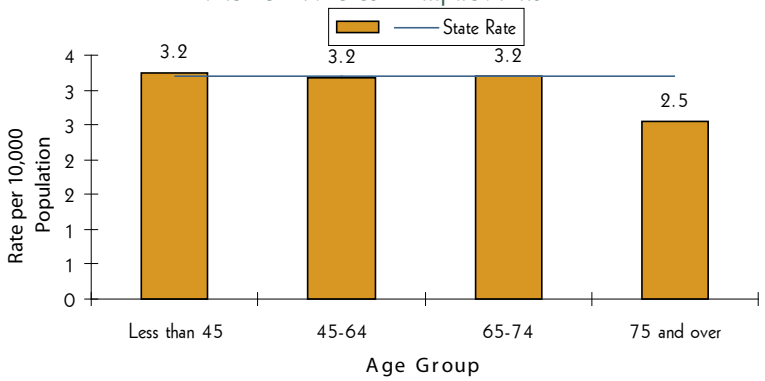
Rates of hospital discharge for cardiovascular conditions with diabetes listed as a contributing diagnosis also increase with age, but the incremental increase is much more dramatic. Rates increase from 1.1 per 10,000 Utahns for among those less than 45 to 195.7 per 10,000 Utahns age 75 or over, which is a nearly 200-fold increase (Figure 28).

Discharges for renal complications also follow an age gradient, up to age group 65 to 74, when it levels off (Figure 29). There are fewer than two discharges per 10,000 Utahns under age 45 years for diabetes-related renal complications. The rate rises to almost 15 per 10,000 Utahns ages 45 to 64. There is a steep incline seen in the rate for those aged 65-74 and for those aged 75 and over (35.6 and 37.2, respectively).

The only condition that does not follow the age gradient pattern is that of acute complications (Figure 30). Rates of hospital discharge for acute complications are constant across the first three age groups at 3.2 per 10,000, followed by a slight decline among those 75 and over (2.5 per 10,000). However, the rates do not tell the full story. The large population denominator in the first age group obscures the pronounced concentration of cases in the younger age groups. Nearly three fourths (74.1%) of the total discharges occur in the 45-and-under age group (Figure 31).

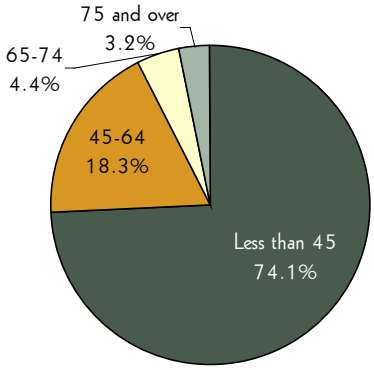
Discharge rates for diabetes-related ophthalmic complications for the 45-and-under age group are less than one per 10,000 Utahns (Figure 32). The rate increases

Figure 30. Age-Specific Rates of Hospital Discharge for Acute Diabetes Complications



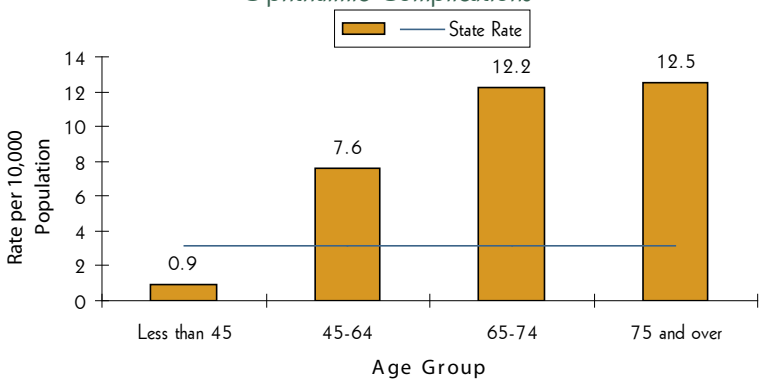
Source: Utah Inpatient Hospital Discharge Database 2004

Figure 31. Percentage Distribution of Discharges for Acute Diabetes Complications by Age Group



Source: Utah Inpatient Hospital Discharge Database 1992-2004

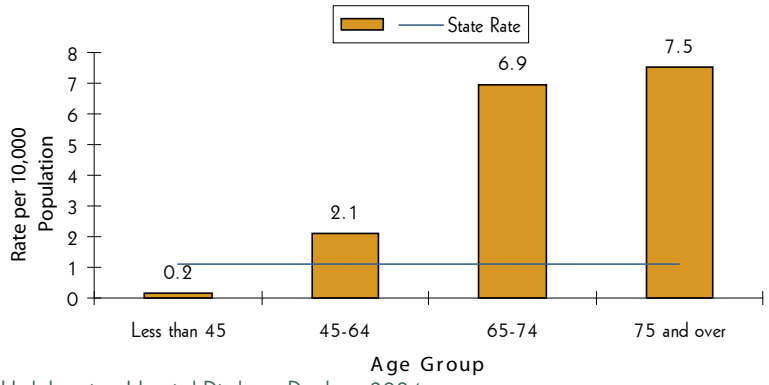
Figure 32. Age-Specific Rates of Hospital Discharge for Diabetes-Related Ophthalmic Complications



Source: Utah Inpatient Hospital Discharge Database 2004



Figure 33. Age-Specific Rates of Hospital Discharge for Diabetes-Related Lower-Extremity Amputations



Source: Utah Inpatient Hospital Discharge Database 2004

dramatically for those aged 45 to 64, (7.6 per 10,000) followed by a slight increase among those aged 65 to 74, and then levels off for the 75 and over age group (12.5 per 10,000).

Hospital discharge rates for diabetes-related lower-extremity amputations are low up to age 65 (Figure 33). Rates more than triple between the age groups 45 to 64 (2.1 per 10,000) and 65 to 74 (6.9 per

Economics of Diabetes
Section Five

A study by the American Diabetes Association conducted through the Lewin Group, Inc., estimated the direct costs of all health care in the U.S. (e.g., physician visits, hospitalizations, and medications) in 2002 to be $865 billion. Components of expenditures in this study did not include school-based and public health clinics, dental care, podiatric care, vision care [except for ophthalmology services, which are included], and over-the-counter medications.

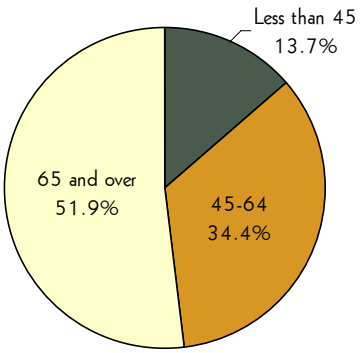
Diabetes is one of the most costly of chronic diseases. Nationally, one in every ten health care dollars (10.6%), or $91.8 billion, was spent in 2002 for direct health care costs by people with diabetes.[4]

Age increases the cost of health care in general. This association was certainly found in the ADA study of diabetes costs. National data indicated that over half (51.9%) of the costs for people with diabetes were incurred by those aged 65 or older (Figure 34). About one-third (34.4%) of the costs were incurred by those aged 45 to 64, and about one-seventh (13.7%) were incurred by the population with diabetes under age 45.[4]

The ADA study found that institutional care (i.e., hospitalization and nursing home care) comprised the largest component at fifty-nine percent (59.0%) of direct medical costs, or approximately $54 billion in 2002. Outpatient care, including office visits, home health care, hospice, and hospital outpatient care, accounted for 21.9 percent of direct costs, or about $20 billion in 2002. Oral medications, insulin and insulin-related supplies were estimated to make up about 19.1 percent of direct costs, or $17.5 billion.

The ADA study found the average dollar amount for medical expenditures for people with diabetes was $13,243, more than five times the average amount of $2,560 spent for people without diabetes. The older age of the diabetes population undoubtedly influences this disparity, but even after adjusting for age, this excess cost for people with diabetes remained. Further adjustments for gender and race/ethnicity reduced the discrepancy by only half. After adjusting simultaneously for a full range of potentially confounding variables (including

Figure 34. Percentage Distribution of Direct Health Care Costs by Age Group for U.S. Residents with Diabetes



Source: American Diabetes Association, Diabetes Care (2003) **26:917-932**



age, gender, and race/ethnicity), the medical expenditures by people with diabetes were still nearly two and one-half times higher than those incurred by people without diabetes.[38] An earlier study conducted in 1992 by Rubin, et al. through Lewin-VHI, Inc., found similar excess costs for diabetes. Rubin found that per capita costs for people with diabetes were more than four times those for people without diabetes ($11,157 vs. $2,604).[39]

Costs of Diabetes in Utah

Direct Costs of Diabetes

Applying the national estimates to the Utah population, the burden of diabetes on the state health care system becomes more apparent. An estimated 93,600 Utah residents have been diagnosed with diabetes. Applying the per capita cost to each person with diabetes, total medical costs for treating diabetes in Utah amount to more than one billion dollars a year (approximately $1,239,544,800). Because Utah health care costs are lower than the U.S. in general, using the U.S. per capita costs may overstate the estimate, particularly given the younger age distribution and the lower percentage of racial/ethnic minority populations in Utah.[40]

However, if the proportion of the health care cost attributable to hospitalization for Utah is similar to that for the U.S., another way to estimate the economic burden may be to use the cost of hospitalization as the pivotal figure. Hospital charges provide a readily available measure of costs that are reasonably comparable to national figures. Total costs of hospitalization for diabetes as any listed condition in Utah in 2004 was $366,800,824. According to the ADA study, hospital costs alone in the U.S. were $403 billion, or 43.9% of the total direct costs attributable to diabetes. Working backward, the estimated total health care costs in Utah would therefore be $853,025,200. The true cost of health care is likely to lie somewhere between the two estimates of $835 million and $1.2 billion.

Table 3. Average, Median and Total Charges for Hospital Discharges for Diabetes Complications
Utah Inpatient Hospital Discharge Database, 2004

Complication	Mean	Median	Total
Diabetes as primary diagnosis	$13,177	$7,112	$26,696,309
Diabetes as any listed diagnosis	$16,928	$11,134	$366,800,824
Major Cardiovascular Disease	$22,388	$15,860	$113,978,398
Renal Disease, Kidney Transplant or Hemodialysis	$21,447	$13,022	$32,866,408
Acute Metabolic Complications	$9,740	$6,664	$7,607,134
Lower-Extremity Amputation	$24,894	$17,498	$6,397,694
Ophthalmic Manifestations	$20,793	$12,208	$15,449,421

1st listed ICD-9-CM 250 for primary diagnosis of diabetes. Any listed diagnosis includes primary and contributing diagnoses; ICD-9-CM 390-448 as primary diagnosis and any listed ICD-9-CM 250 for major cardiovascular disease; Any listed ICD-9-CM 250.4 OR any listed ICD-9-CM 250 with procedure codes 55.6 (renal transplant) or 39.95 (hemodialysis) for renal disease, kidney transplant, or hemodialysis
ICD-9-CM 250.1 (ketoacidosis), 250.2 (hyperosmolar coma), or 250.3 (other coma) a primary diagnosis for acute metabolic complications; Any listed ICD-9-CM 250 with a procedure code 84.1 for nontraumatic amputation of lower limb (NOT 895-897 for traumatic amputation); Any listed ICD-9-CM 250.5 for ophthalmic manifestations
Note: Conditions are not mutually exclusive. Some discharges did not list a charge.

Hospital Costs

In some of the conditions, few cases have either extremely low or extremely high charges that distort the average. Thus, the median charge, or middlemost value, may provide



a better representation of costs. Hospital charges for diabetes-related conditions vary dramatically by diagnosis. The mean (average) costs, median values (midpoint of all charges), and summed costs for diabetes as the primary diagnosis, any listed diagnosis, and five major diabetes complications are shown in Table 3.

Lower-extremity amputations have both the highest mean and median charges, with total charges for this complication at over $6 million. On the other hand, cardiovascular complications have much lower mean and median charges ($22,388 and $15,860, respectively), but the total charges approach $114 million due to the number of cases.

Indirect Costs of Diabetes

Other components of economic burden are indirect costs, such as lost productivity, disability, and premature mortality. Nationally, the indirect costs of diabetes totaled an estimated $39.8 billion in 2002 (Table 5).

Table 4. Indirect Costs Due to Lost Productivity for the U.S.

	Dollar Amount 2002 U.S. Dollars (in millions)	Percentage of Total
Lost work days	$4,503	11.3
Restricted activity days	$6,256	15.7
Mortality	$21,558	54.2
Permanent disability	$7,494	18.8
Total	$39,810	100.0

Adapted from Table 13- Total cost of diabetes 2002 Diabetes Care 26:917-932, 2003

The largest share of indirect costs associated with diabetes (54.2%) is due to premature mortality. Permanent disability and restricted activity days are the second and third largest components at 18.8 percent and 15.7 percent, respectively. Finally, lost work days comprise about one ninth of all indirect costs at 11.3 percent.

Together, direct and indirect costs of diabetes totaled an estimated $132 billion in the U.S. in 2002. While the measurable costs are enormous, the true burden of diabetes is even greater.



Mortality Section Six

Diabetes as Underlying Cause of Death: Utah and U.S.

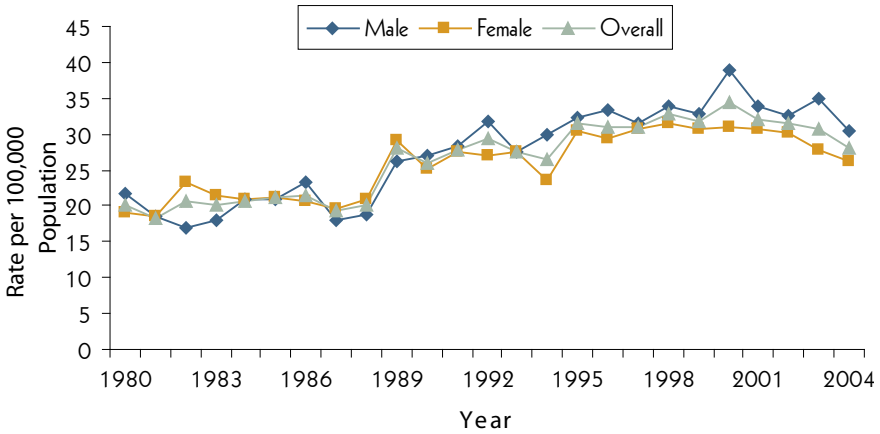
Diabetes is the sixth leading cause of death in Utah and in the U.S. (fifth leading cause from chronic disease). The overall risk of death for people with diabetes is about twice that for people of the same age without diabetes.[2] The burden may be even higher because diabetes is likely to be underreported on death certificates by as much as 35 to 40 percent.[41]

Deaths in Utah are recorded by the Office of Vital Records and Statistics, Utah Department of Health. Causes of death, obtained from physician entries on the death certificate, are classified as underlying or contributing. The underlying cause is the single illness or condition that started the chain of events resulting in death. Contributing causes include any other diseases or conditions listed on the death certificate.

In the U.S. in 2002 (the latest year available for national data at the time of this report), diabetes was listed as the underlying cause of death for 73,249 decedents, and it contributed to 224,092 deaths.[41] In Utah in 2004, diabetes was the underlying cause for 485 deaths, or about one of every 27 deaths. There was a slow but consistent increase in overall death rates in Utah until 2001, when the diabetes death rate began to decline (Figure 35) (Note that the rates shown take into consideration a 1999 change in ICD codes).

Diabetes death rates for Utah are consistently higher than those for the U.S. Most recent comparable data (standardized to the 2000 U.S. population) show a death rate of 31.6 per 100,000 population for Utah (2002) compared to 25.4 per 100,000 for the U.S. (2002).[44] (Note: As stated above, in 2004, the Utah death rate for diabetes was 28.0). The higher death rate for diabetes in Utah may seem unexpected in light of its lower than national prevalence of diabetes; however, several factors may help to explain this higher rate: 1) Utahns have a longer life expectancy than U.S. residents as a whole, increasing the lifetime opportunity for diabetes to be diagnosed; 2) there may be a difference in the accuracy of recording diabetes deaths; or 3) rates of death for causes other than diabetes are lower in Utah (less competing mortality). For example, the relatively lower rate of deaths from cancer in Utah, particularly lung cancer,

Figure 35. Age-Adjusted Rates for Diabetes as Underlying Cause of Death per 100,000 Utah Population, Overall and by Gender, 1980-2004



Source: Utah Office of Vital Records and Statistics, 1980-2004

increases the chance that a person may die with diabetes instead.

Both nationally and in Utah, diabetes death rates for males have consistently been higher than rates for females.[1] The rates for diabetes as the underlying cause of death for Utah, age-adjusted to the U.S. 2000 population, are shown in Figure 35. In 2004, the overall age-adjusted gender-specific rate for males was 30.4 per 100,000 population, compared to 26.3 per 100,000 population for females.

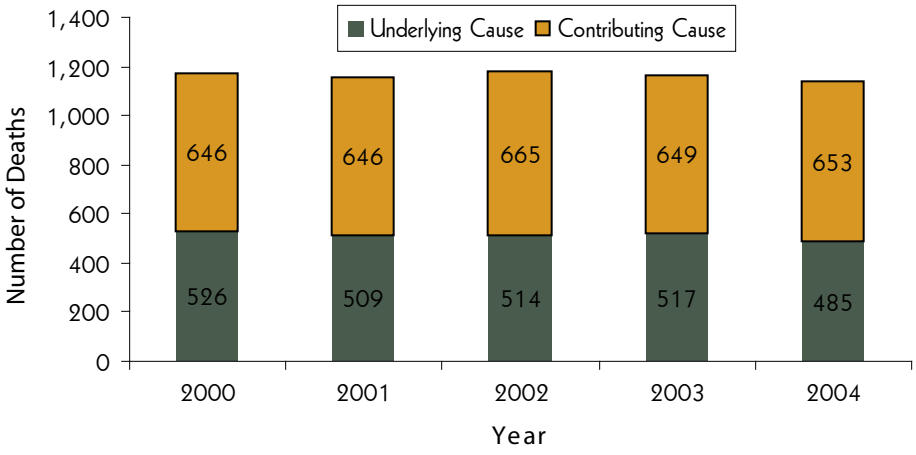
Diabetes as a Contributing Cause of Death

Of the approximately 13,000 annual deaths among Utah residents between 2000 and 2004, more than 1,100 had diabetes as either the underlying or a contributing cause (Figure 36). It is readily apparent that adding deaths with diabetes as a contributing cause substantially alters the mortality picture and the full significance of diabetes on deaths in Utah may be more clearly observed.

For the largest proportion of decedents with diabetes, more than two-fifths (42.6%) of deaths listed diabetes as the underlying cause (Figure 37). Nevertheless, a substantial percentage of diabetes-related deaths listed heart disease as the underlying cause (22.2%). Together, diabetes and heart disease accounted for nearly 65 percent (64.8%) of deaths for Utah decedents with diabetes.

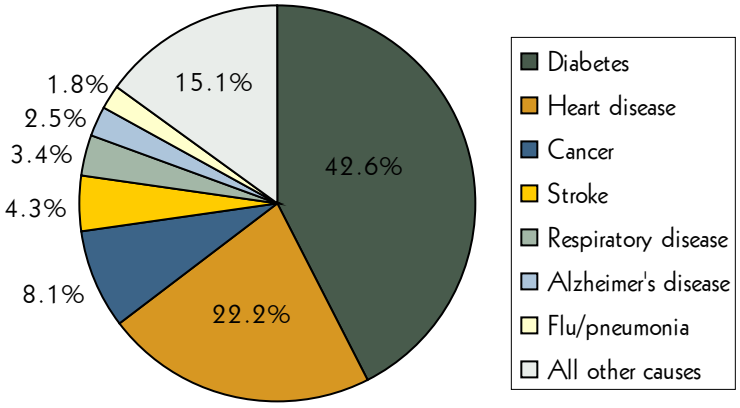
A relatively small proportion of diabetes-related deaths listed cancer (8.1%) and stroke (4.3%) as the underlying causes. Other notable underlying causes of death among decedents with diabetes were respiratory disease, Alzheimer's disease, flu, and pneumonia.

Figure 36. Number of Deaths With Diabetes as Underlying and Contributing Causes for Utah Residents



Source: Utah Office of Vital Records and Statistics, 2000-2004

Figure 37. Leading Causes of Death Among People with Diabetes 2004



Source: Utah Office of Vital Records and Statistics, 2004



Current Connections
Section Seven

Current Connections: National and State Efforts to Prevent and Control Diabetes

National Programs
A number of efforts to prevent and control diabetes are being conducted at national and state levels.

Diabetes Control Programs in the U.S.
The CDC focuses on Native Americans, a population well known for its risk of developing diabetes. The Native Diabetes Wellness Program (formerly the National Diabetes Prevention Center) is a program designed to support Native American communities and alliances in their efforts to prevent diabetes complications. The program develops interventions that address and incorporate culturally sensitive strategies.

A major health concern is the rapid increase in type 2 diabetes among American youth. In order to track incidence, prevalence and quality of care for diabetes in youth, the CDC and the National Institutes of Health (NIH) have jointly sponsored a five-year, six-site study to examine diabetes status among adolescents and children called SEARCH for Diabetes in Youth. A full list of projects undertaken by the CDC can by found at Diabetes Projects, http://www.cdc.gov/diabetes/projects/index.htm

Diabetes Prevention Programs in the U.S.
The first clinical trial to examine whether diabetes can be delayed or prevented among people at high risk was the Finnish Diabetes Prevention Study. This study, completed in 2001, clearly showed that lifestyle modifications that included modest weight loss and physical activity substantially reduced progression to diabetes among middle-aged adults with impaired glucose tolerance.
See: http://www.cdc.gov/diabetes/news/finnish.htm

In 2001, the Diabetes Prevention Program (DPP), a study founded by NIH, demonstrated that people at high risk for developing diabetes (with impaired glucose tolerance) can delay or prevent developing full-blown type 2 diabetes through lifestyle modifications. A surprising finding of this study was that weight loss and engagement in physical activity had a stronger impact on preventing diabetes than metformin, an oral medication that until that time had only been used to treat, not prevent, diabetes. The effectiveness of lifestyle modifications was found for both genders, all racial/ethnic groups, and all ages, although the greatest impact was seen for people aged 60 or over. Investigators found the results to be so dramatic and effective for those in the experimental groups, they felt it was unethical to continue the study.
For a full report of the DPP, see:
http://www.cdc.gov/diabetes/news/docs/dpp.htm

The success of the DPP spurred the National Diabetes Education Program (NDEP) to develop the "Small Steps. Big Rewards. Prevent type 2 Diabetes" campaign. Messages and materials target people at risk for developing diabetes.



The campaign also works with providers to promote their encouragement of diabetes prevention by providing information and tools to help their patients adopt the small steps that will help them prevent diabetes. See: http://ndep.nih.gov/campaigns/SmallSteps/SmallSteps_index.htm

In August 2005, the Division of Diabetes Translations (DDT), under the direction of the Centers for Disease Control and Prevention (CDC) organized a committee to plan the implementation of pilot programs to promote prevention at the state level. The committee is developing methods to identify high risk populations, policies for risk reduction, and interventions aimed at slowing the rising rate of diabetes. See: http://www.cdc.gov/nccdphp/publications/aag/ddt.htm.

Utah Efforts

A great deal of work is also being conducted at the state level to prevent diabetes and to control its complications. In Utah, the Utah Diabetes Prevention and Control Program (DPCP) has made considerable progress in working with partners to reduce the risk of complications. The DPCP works with local health departments, community-based organizations, tribes, and other racial and/or ethnic minority populations to provide local programs. In addition, the DPCP strives to develop and produce culturally and linguistically appropriate education manuals for people with diabetes. The program currently provides diabetes education and management materials in 11 languages.

The DPCP has developed diabetes practice guidelines on specific topics to improve the quality of diabetes care. It works with a committee of health care professionals to develop diabetes practice recommendations. The committee works with medical and clinical professionals to promote the implementation of these guidelines.

The DPCP works with third-party payers to improve coverage for recommended diabetes services and supplies. As part of this effort, the DPCP monitors Health Plan Employer Data and Information Set (HEDIS) outcome measures from six statewide health plans to improve the quality of diabetes care provided to patients enrolled in these plans. The six diabetes HEDIS measures have been tracked since 1999: A1C exam; A1C benchmark, LDL testing, LDL control (<130 mg/dL), annual eye exam and annual screening for nephropathy. A seventh HEDIS measure , LDL control (less than 100 mg/dL), was added in 2006.

The DPCP has established state certification for qualifying self-management education programs to improve patient access to diabetes education. It also works to improve quality of care and provides state certification in order to qualify programs for reimbursement. The DPCP certifies 16 or 17 programs in Utah at any given time.

The DPCP provides professional education on diabetes topics for physicians and other providers through conferences, informal seminars, and telehealth satellite broadcasts. It works with partners to develop and provide professional education to clinicians and other professionals. These training sessions are provided monthly and participants can register on-line at http://health.utah.gov/diabetes.



The DPCP conducts public awareness campaigns on an ongoing basis. These efforts are coordinated with partners to most effectively deliver similar messages through appropriate channels to target populations.

The DPCP works with other state-level chronic disease programs to encourage employers to advance an environment that reduces the risks of diabetes.

Additionally, the DPCP actively participates with the Association of Community Health Centers (AUCH) as part of the Health Resources and Services Administration (HRSA) Diabetes Collaborative program. AUCH is the Primary Care Association for the state of Utah. AUCH members include Federally Qualified Health Centers (FQHC) and other comprehensive health care providers that strive to meet the needs of the medically underserved in Utah. AUCH and its member organizations are part of a statewide and national movement to reduce barriers to health care by enhancing primary care service delivery through prevention, health promotion, and community participation. The community health centers operated by AUCH members offer primary medical, dental, and mental health care to medically underserved populations and/or in medically underserved areas. AUCH members operate service sites throughout the state of Utah, and served nearly 85,000 patients in 2005. The majority of the patient base of AUCH members are low-income, uninsured, and of a racial or ethnic minority group. AUCH membership organizations provide assistance to individuals and groups who have traditionally experienced difficulties in access to a regular health care provider.

Prevention Efforts in Utah

A number of DPCP partners are targeting interventions and outreach to prevent diabetes in high-risk populations.

Comunidades Unidas (United Communities)

is a promotora program that conducts community outreach in two communities with a high concentration of Hispanic/Latino population (Midvale and Rose Park). Leaders train community outreach workers to increase awareness of diabetes by conducting neighborhood contacts, and coordinates efforts to improve access to diabetes care.

Comunidades Unidas
695 West Center Street
Midvale, UT 84047
claudia@cuutah.org
Phone: (801) 566-6191
Fax: (801) 566-6192

Community Health Connect

focuses on the Hispanic/Latino population in the Provo area. This program has also formed a local diabetes coalition to coordinate diabetes efforts in Utah County.

Community Health Connect
250 West Center Street
Provo, UT 84601
ivonne@communityhealthconnect.org
Phone: (801) 818-3014
Fax: (801) 818-1003



Utah Navajo Health System

is a program designed to work with members of the Navajo Indian Tribe to prevent diabetes and its complications. The program was developed to work with the San Juan School District in implementing a program to prevent obesity and diabetes. The College of Eastern Utah in Blanding and Indian Health Services are major partners. This program promotes awareness of the importance of lifestyles and consistently submits articles to local newspapers on healthy lifestyle choices. Inservice programs with Utah Navajo Health System personnel are conducted to educate them on healthy eating and physical activity choices.

Utah Navajo Health Systems
P.O. Box 130
Montezuma Creek, UT 84534
djensen@unhsinc.com
Phone: (435)651-3291
Fax: (435) 651-3376

Diabetes Today in the Pacific Islander Community

The National Tongan American Society (NTAS) has made remarkable progress in its grassroots efforts to encourage Tongans and Samoans to make the lifestyle changes needed to prevent diabetes and to reduce the risk of complications among those diagnosed. Weekly education classes, held at churches and senior centers in the Salt Lake City area, are conducted in English and Tongan. The classes have become so popular, they are filled to capacity and a long waiting list has been established.

National Tongan American Society
2480 South Main #112
Salt Lake City, UT 84115
Phone: (801) 467-8712
Fax: (801) 487-2656
ntas.slc@planet-tonga.com
www.ntasutah.org



Technical Notes Appendix

Data Notes

Data for this report are drawn from several sources which include both survey and population-based data.

Three primary surveys are used: the Utah Health Status Survey (UHSS), the Utahns with Diabetes Survey (UWD), and the Behavioral Risk Factor Surveillance System (BRFSS). The Utah Health Status Survey (UHSS) is a statewide household-level survey that includes information on both adults and children. The UWD Survey is a follow-up survey to the UHSS. Data for this report are from the 2002 UWD Survey. The Utah Behavioral Risk Surveillance System (BRFSS) collects uniform, state-specific data on preventive health practices and risk behaviors that are linked to chronic diseases, injuries, and preventable infectious diseases in the adult population. The BRFSS is one of the primary data sources for tracking diabetes prevalence, care and complications in the state. Approximately 5,000 Utah adults aged 18 and over are interviewed for the survey each year.

The Utah Hospital Discharge Database (HDDB) contains consolidated information on complete billing, medical codes, and personal characteristics describing a patient, the services received, and charges billed for each inpatient hospital stay. The Office of Health Care Statistics (OHCS) receives discharge data quarterly from hospitals in various formats and media which are converted into a standardized format. The data are validated through a process of automated editing and report verification.

Death certificates in Utah are required to be filed by funeral directors. Funeral directors obtain demographic information from an informant, a close family member of the decedent. The cause of death is certified by the decedent's physician or the physician who attended the death. Accidental and suspicious deaths are certified by the Medical Examiner. Death certificate data go through extensive edits for completeness and consistency. The Office of Vital Records and Statistics (OVRS) conducts annual trainings for funeral directors and local registrars. When death certificates are received the causes of death are keyed into software locally by the Office of Vital Records and Statistics (OVRS), then shipped to the National Center for Health Statistics (NCHS), where they are machine-coded into ICD-10 codes. NCHS returns the ICD-10 codes to OVRS where the death records are updated.

Age-adjusted rates are frequently used throughout this report, particularly when comparisons are made among groups or across time. Age-adjusted rates are artificial rates used to compare trends adjusted for the effect of age. For example, there has been a notable increase in the prevalence of diabetes. While the aging of the population certainly increases the prevalence of diabetes in a population, the evidence of an increase that is maintained after age-adjustment suggests that much of the increase is due to factors other than age.



Table 5. Crude and Age-Adjusted Prevalence Rates of Diagnosed Diabetes Among Utah Adults (Percentages Diagnosed) BRFSS 1993-2004

Year	Crude Rate	Lower Confidence Interval	Upper Confidence Interval	Age-Adjusted Rate	Lower Confidence Interval	Upper Confidence Interval
1993	3.5	2.7	4.5	3.9	3	5.1
1994	3.9	3.0	4.9	4.5	3.5	5.7
1995	3.7	2.9	4.7	4.3	3.4	5.5
1996	3.3	2.6	4.1	3.7	3	4.7
1997	4.1	3.2	5.3	4.6	3.6	5.8
1998	4.4	3.5	5.5	4.8	3.8	5.8
1999	4.2	3.4	5.2	4.6	3.7	5.6
2000	5.4	4.4	6.6	5.8	4.7	7.0
2001	4.3	3.5	5.2	4.6	3.8	5.5
2002	4.4	3.6	5.3	5.2	4.4	6.2
2003	5.5	4.7	6.4	6.5	5.6	7.6
2004	5.1	4.4	5.8	5.9	5.2	6.7



Healthy People 2010 Objectives

5-1. Increase the proportion of persons with diabetes who receive formal diabetes education.

5-2. Prevent diabetes.

5-3. Reduce the overall rate of diabetes that is clinically diagnosed.

5-4. Increase the proportion of adults with diabetes whose condition has been diagnosed.

5-5. Reduce the diabetes death rate.

5-6. Reduce diabetes-related deaths among persons with diabetes.

5-7. Reduce deaths from cardiovascular disease in persons with diabetes.

5-8. (Developmental) Decrease the proportion of pregnant women with gestational diabetes.

5-9. (Developmental) Reduce the frequency of foot ulcers in persons with diabetes.

5-10. Reduce the rate of lower extremity amputations in persons with diabetes.

5-11. (Developmental) Increase the proportion of persons with diabetes who obtain an annual urinary microalbumin measurement.

5-12. Increase the proportion of adults with diabetes who have a glycosylated hemoglobin measurement at least once a year.

5-13. Increase the proportion of adults with diabetes who have an annual dilated eye examination.

5-14. Increase the proportion of adults with diabetes who have at least an annual foot examination.

5-15. Increase the proportion of persons with diabetes who have at least an annual dental examination.

5-16. Increase the proportion of adults with diabetes who take aspirin at least 15 times per month.

5-17. Increase the proportion of adults with diabetes who perform self-blood-glucose-monitoring at least once daily.

http://www.healthypeople.gov/Document/Word/Volume1/05Diabetes.doc



Table 6. Percentages, Confidence Intervals, and Data Sources for Survey Data Presented in Report

Figure Number and Title	Percentage	Lower Confidence Limit	Upper Confidence Limit	Data Source
Figure 1. Age-Adjusted Prevalence of Diagnosed Diabetes Among Utah Adults 1993-2005				BRFSS 1993-2005
1993	3.9	2	5.1	
1994	4.5	3.5	5.7	
1995	4.3	3.4	5.5	
1996	3.7	3	4.7	
1997	4.6	3.6	5.8	
1998	4.8	3.9	5.9	
1999	4.6	2.7	5.6	
2000	5.8	4.7	7	
2001	4.6	3.8	5.5	
2002	5.2	4.4	6.2	
2003	6.5	5.6	7.6	
2004	5.9	5.2	6.7	
2005	6.5	5.8	7.3	
Figure 3. Percentage of Utahns With Diabetes by Race/Ethnicity (Crude Rates)				UHSS 2001
Native American	6.2	3.7	8.8	
Pacific Islander	4.5	1.2	7.8	
African American	3.7	0	7.5	
Non-Hispanic White	3.6	3.3	3.9	
Asian American	3.4	1.3	5.6	
Hispanic/Latino	2.4	1.6	3.2	
Figure 4. Age-Adjusted Percentages of Diabetes by Race/Ethnicity				UHSS 2001
Native American	8	5	11.1	
Pacific Islander	5.8	1.2	10.4	
African American	7	0.6	13.4	
Non-Hispanic White	4.4	4	4.8	
Asian American	5.2	2.1	8.3	
Hispanic/Latino	5.6	3.7	7.5	



Figure 5 (Total) Percentage of Utah Adults Diagnosed With Diabetes by Age Group: Overall and by Gender				BRFSS 2003-2005
18-34	1.2	0.8	1.6	
35-49	3.5	2.8	4.3	
50-64	10	8.8	11.4	
65+	16.6	14.8	18.6	
Total	5.3	4.9	5.8	
Figure 5 (Male). Percentage of Utah Adults Diagnosed With Diabetes by Age Group: Overall and by Gender				BRFSS 2003-2005
18-34	1.3	0.8	2	
35-49	3.8	2.8	5.1	
50-64	11.3	9.4	13.5	
65+	18.7	15.8	22	
Total	5.7	5.1	6.4	
Figure 5 (Female) Percentage of Utah Adults Diagnosed With Diabetes by Age Group: Overall and by Gender				BRFSS 2003-2005
18-34	1	0.8	1.7	
35-49	3.2	2.4	4.3	
50-64	8.7	7.2	10.5	
65+	15	12.8	17.4	
Total	5	4.4	5.5	
Figure 6. Age-Adjusted Percentage of Adults Diagnosed with Diabetes by Annual Household Income				BRFSS 2003-2005
Less than $20,000	10	8.4	11.9	
$20-49,999	6.7	5.9	7.6	
$50,000 and over	5.3	4.4	6.4	
Figure 7. Age-Adjusted Percentage of Utah Adults Diagnosed with Diabetes by Education Level				BRFSS 2003-2005
Less than high school	9.2	7.1	12	
High school/GED	6.1	5.3	7.1	
Some college	6.7	5.9	7.6	
College graduate	5.6	4.7	6.5	
Figure 8. Age-Adjusted Percentages of Utah Adults Without Health Insurance Coverage With Diabetes and Statewide				BRFSS 2003-2005
With diabetes	9.7	6.3	14.7	
Statewide	14.2	13.3	15	

Figure 9. (With Diabetes) Age-Adjusted Percentage of Utah Adults, With and Without Diabetes, By Weight Status				BRFSS 2003-2005
Not overweight	19.6	14.9	25.4	
Moderately overweight	29.4	23.9	35.7	
Obese	51	44.6	57.3	
Figure 9. (Without Diabetes) Age-Adjusted Percentage of Utah Adults, With and Without Diabetes, By Weight Status				BRFSS 2003-2005
Not overweight	43.8	42.7	44.8	
Moderately overweight	36.4	35.4	37.5	
Obese	19.8	18.9	20.7	
Figure 10. Age-Adjusted Percentage of Utah Adults, With and Without Who Meet the Recommended Level of Physical Activity				BRFSS 2003, 2005
With diabetes	42.7	35.6	50.2	
Without diabetes	55.4	54	56.7	
Figure 11. Age-Adjusted Percentage of Utah Adults, With and Without Diabetes, Who Meet the Recommended Nutrition Guidelines				BRFSS 2003-2005
With diabetes	21.7	17	27.4	
Without diabetes	21.8	20.7	22.9	
Figure 12. Age Adjusted Rates of Number of Physician Visits in Past 12 Months Reported by Utah Adults With Diabetes				BRFSS 2003-2005
No times	8.7	5.4	13.7	
One	12.2	8.9	16.7	
Two	25.7	20.2	32.1	
Three	14.4	10.8	19.1	
Four	17.2	13.1	22.2	
Five or more	21.8	16.8	27.7	
Figure 13. Age-Adjusted Percentage of Utah Adults Diagnosed With Diabetes Who Obtained At Least One and At Least Two A1C Exams in Prior 12 Months 2000-2004				BRFSS 2000-2005
2000	63.5	50.8	74.5	
2001	77	66.7	84.8	
2002	78.2	67.9	85.9	
2003	71.7	60.5	80.6	
2004	72	62.1	80.1	
2005	54.9	46.9	62.6	



Figure 14. Age-Adjusted Percentage of Utah Adults Diagnosed With Diabetes Who Have a Foot Exam Conducted by a Health Care Professional Within Past 12 Months, 1996-2005				BRFSS 1996-2005
1996	62.3	52.1	71.6	
1997	67.3	58.4	75.2	
1998	61.4	45.4	75.3	
1999	71.6	63.8	78.3	
2000	69.6	58	79.1	
2001	78.4	67.3	86.4	
2002	75.6	63.9	84.4	
2003	78.2	70.2	84.6	
2004	60.4	50.6	69.4	
2005	77.4	70	83.4	
Figure 15. Age-Adjusted Percentage of Utah Adults With Diabetes Who Had a Dilated Eye Exam in Past 12 Months, 1994-2004				BRFSS 1994-2005
1994	61.5	50.5	71.5	
1995	70.7	59.5	79.9	
1996	68.4	54.8	79.4	
1997	65.1	55.6	73.5	
1998	56.6	43	69.3	
1999	67.1	53.9	78	
2000	69.3	54.4	81.1	
2001	59.1	48.6	68.8	
2002	74.5	62.6	83.7	
2003	58.7	45.6	70.6	
2004	60.2	50.1	69.5	
2005	53.4	46.1	60.5	
Figure 16. Age-Adjusted Percentage of Utah Adults With Diabetes Who Have Had Recommended Vaccinations for Flu and Pneumonia				BRFSS 2003-2005
Flu	58.7	50.7	66.2	
Pneumonia	49.3	41	57.6	
Figure 17. Age-Adjusted Percentage of Utah Adults, Age 65 and Over, With Diabetes Who Have Had Recommended Vaccinations for Flu and Pneumonia				BRFSS 2003-2005
Flu	81.9	75.3	87	
Pneumonia	74.5	66.5	81.1	



Figure 18. Age-Adjusted Percentage of Utah Adults With Diabetes Who Checked Their Blood Glucose Levels at Least Daily 1994-2005				BRFSS 1994-2005
1994	43.4	29.7	58.3	
1995	44.6	33	56.8	
1996	48.8	38.5	59.2	
1997	58.1	43.8	71.1	
1998	60	48.8	70.2	
1999	39.2	30.6	48.5	
2000	69.6	59.3	78.3	
2001	52.2	39.5	64.6	
2002	67	56.2	76.3	
2003	66.9	56.4	75.9	
2004	66.4	56.4	75.2	
2005	66.4	58.8	73.3	
Figure 19. Age-Adjusted Percentage of Utah Adults With Diabetes Who Reported Checking Feet by Selected Time Interval 2003-2005				BRFSS 2002-2005
Never	14.7	10.8	19.7	
Daily	51.5	45.6	57.4	
Weekly	24.5	19.1	30.8	
Monthly	8.4	4.9	13.9	
Annually	1	0.5	1.9	
Figure 20. Age-Adjusted Percentages of Utah Adults Diagnosed With Diabetes Reporting They Have Ever Had Diabetes Education 2000-2005				BRFSS 2000-2005
2000	67.6	57	76.6	
2001	56.8	47.6	65.6	
2002	56.4	42.8	69	
2003	63	52.3	72.5	
2004	61.5	52	70.3	
2005	67.2	58.6	74.7	
Figure 24. Age-Adjusted Percentages of Various Treatment Regimens Used by Adults Diagnosed With Diabetes				BRFSS 2003-2005
Insulin alone	27.5	21.7	34.2	
Oral meds alone	45.3	39.6	51.1	
Insulin and oral meds	10.6	8	13.9	
Neither insulin nor oral meds	16.7	12.3	22.2	



Figure 25. Age-Adjusted Percentage of Utah Adults Diagnosed With Diabetes Reporting Having Complications				BRFSS 2003-2005
Foot ulcers	14	9.7	19.7	
Diabetic Retinopathy	16.5	12.2	21.9	
UHSS Utah Health Status Survey				
BRFSSBehavioral Risk Factor Surveillance System				



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